This manual is correct to 26 July 1955

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DEMOLITION MATERIALS

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***This manual supersedes TB 9–1940–6, 25 March 1944; TB 9–1940–9, 11 September 1944, and TB ORD 214, 28 October 1944; and those portions of TM 9–1940, 15 July 1943, and C1, 7 August 1944; TB 9–1940–11, 2 August 1950; material of a technical nature of TM 5–220, 3 July 1945; and FM 5–25, 2 September 1954, that pertain to the demolition materials covered herein.**

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CHAPTER 1

GENERAL

Section I. INTRODUCTION

1. Scope

a. This manual provides information of a technical nature pertaining to the classification, identification, care, use, storage, packing and marking, and destruction to prevent enemy use of demolition materials.

b. For principles, doctrines, and policies governing the tactical use of the demolition materials covered herein and the training and field operating procedures incident thereto, see FM 5–25.

c. This manual differs from that part of TM 9–1940, 15 July 1943, in that it covers all current demolition materials and deletes information on demolition block M4 and combination firing device M1.

2. Field Report of Accidents

If an accident or malfunction involving the use of ammunition occurs during training or combat, the range officer for a unit in training or the officer or noncommissioned officer in charge of the firing unit in combat will immediately discontinue firing ammunition of the lot that malfunctions, then report the occurrence and all pertinent facts of the accident or malfunction to the technical service officer under whose supervision the ammunition for the unit involved is maintained or issued, in order that the action prescribed in SR 700–45–6 may be taken. If conditions of combat preclude immediate compliance, the action prescribed above will be taken as soon as practicable.

Section II. GENERAL DISCUSSION

3. Types of Demolition Materials

Demolition materials, representative types of which are shown in figure 1, consist of various types of high-explosive charges, equipment, initiating devices, and priming material required in their employment in military demolition work. Certain demolition materials are grouped into "sets" and "kits" (pars. 90–103) for convenience in performing various kinds of demolition.

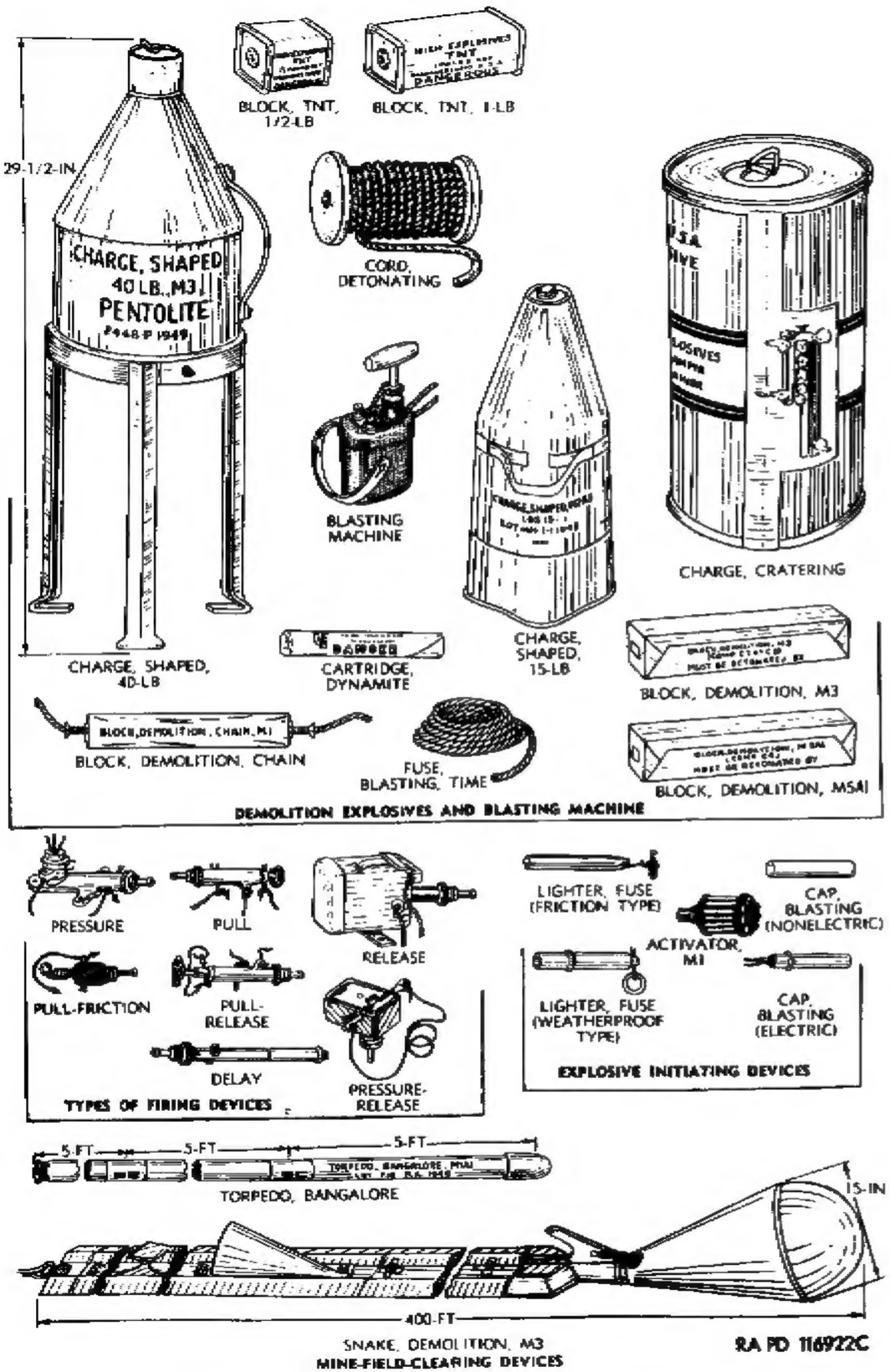

Figure 1. Representative types of demolition materials.

4. Booby Traps

a. A booby trap (fig. 2) is an explosive charge, either a standard mine or an improvised charge, that is exploded when a person disturbs an apparently harmless object. Although booby traps may be used in antipersonnel mine fields, they are not classified as antipersonnel mines.

b. Booby traps are intended to be initiated by enemy action on a concealed explosive device by pressure, by lifting an object, thus releasing pressure, or by moving a concealed trip wire. In general, booby traps are set with firing devices, which are equipped with safety pins, clips, forks, or keys, known as organic safeties (fig. 3).

5. Definitions and Terms

a. Adapter (Priming). A plastic connector (fig. 40) used to connect detonating cord, safety fuse M700, time blasting fuse, or electric firing systems to a demolition block.

b. Blasting Cap. A ¼-inch diameter (approx) metal tube or shell (figs. 38 and 39) containing a high explosive used to detonate a less sensitive explosive. There are two types of blasting cap, electric and nonelectric. The electric type is fired by an electric current and the nonelectric type is fired by safety fuse M700, time blasting fuse, or a firing device. In the firing chain, the blasting cap is the element that fires the main charge, or, the blasting cap may be the element that initiates a detonating cord, which fires the main charge.

c. Blasting Machine. A small hand-operated magneto-type electric generator (fig. 43), which is used to fire electric blasting caps. Push-down-type machines of 30-cap, 50-cap, and 100-cap capacities and a twist-type machine of 10-cap capacity are provided.

d. Block, Demolition. The term applied to a quantity (such as ½ lb, 1 lb, or 2¼ lb) (figs. 6 and 7) of high explosive, such as tetrytol or COMP C series explosives, to which a firing device or blasting cap with safety fuse or electric lead, whichever is applicable, may be attached for use in demolition work or as an improvised mine.

e. Breaching. The employment of any available means to secure a gap through an enemy mine field or obstacle.

f. Cable, Detonating. Especially designed demolition cable (figs. 62–66) composed of strands of detonating cord used for clearing mine fields.

g. Cap Well. Opening in demolition blocks and in certain types of mines, threaded to receive a firing device with blasting cap or to receive an adapter to which a time blasting fuse and nonelectric blasting cap or electric leads and an electric blasting cap are to be attached.

h. Cartridge. In demolition work, the correct term for a cylindrical piece of dynamite—sometimes popularly known as a "stick"

of dynamite (fig. 15). The term "cartridge" is also sometimes used for an explosive element of a demolition snake.

i. Charge. Any amount of explosive required to accomplish a particular mission. A charge may vary in size from a few ounces to several thousand pounds.

j. Cord, Detonating. A cord (figs. 23 and 24) that contains a core of high-explosive, PETN, wrapped in a plastic cover. The detonating cord, when properly initiated, explodes throughout its entire length, detonating any properly connected demolition charge or mine.

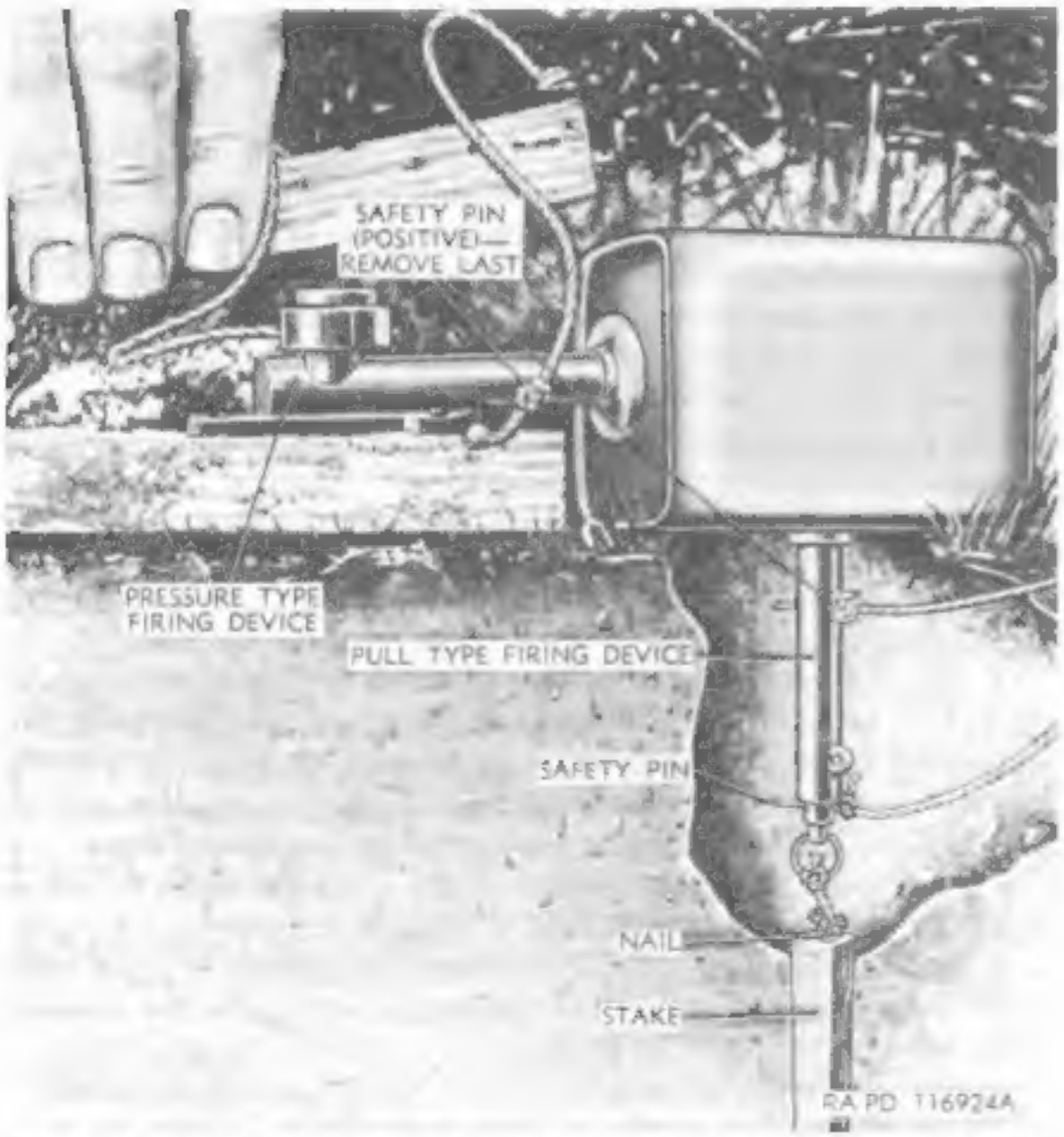

Figure 2. Explosive charge with pressure-type firing device "activated" with pull-type firing device—safety pins and fork to be removed after laying board lightly on pressure-type firing device.

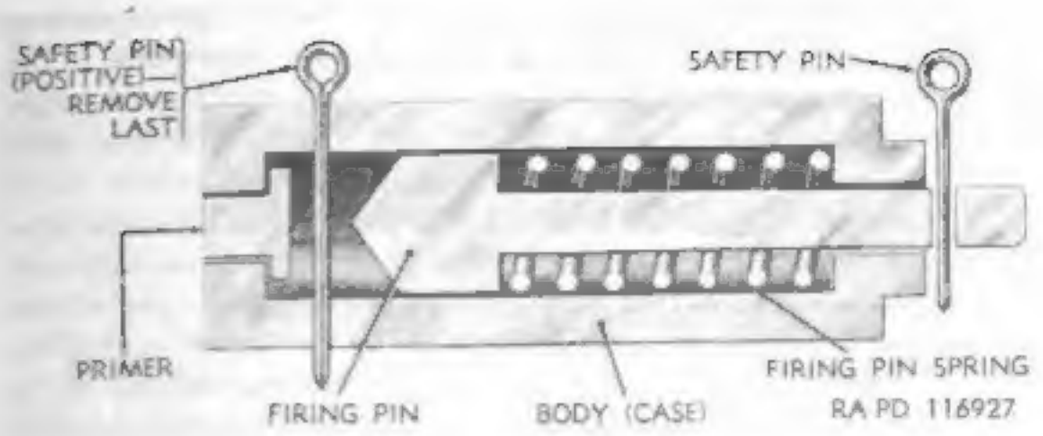

Figure 3. Schematic arrangement of firing device safeties and components.

k. Coupling Base. A metal coupling (figs. 27–36) containing a percussion primer and having a nipple to which a black powder igniter or blasting cap may be attached. The coupling base is threaded at one end to screw into a standard firing mechanism and at the other end to screw into a cap well of a demolition block or certain types of mines.

l. Crimper, Cap. This is a special plier-like tool (BB, fig. 47) used for cutting detonating cord, safety fuse, or time blasting fuse and for crimping a nonelectric blasting cap to detonating cord, safety fuse, or time blasting fuse, or crimping a blasting cap to the coupling base of a firing device. One handle of the crimper is pointed for making a hole in a dynamite cartridge; the other handle is flattened to form a screwdriver.

m. Demolition Material. The explosives, devices, and equipment used in demolition work. If conditions require, antitank mines may be used for demolition.

n. Detonation. Detonation is the reaction that takes places when a high-explosive is exploded. As the mass of high explosive is initiated, a detonating wave is created that progresses throughout the mass transforming it instantly into gases.

(1) *Low-order detonation.* The incomplete detonation of an explosive charge in a bomb, projectile, or other high explosive.

(2) *High-order detonation.* A complete and instantaneous explosion.

o. Detonator. A device (figs. 17–19), consisting of a primer composition charge and one or more additional high-explosive charges of different compositions, arranged in order of decreasing sensitivity and increasing quantity, used for exploding an explosive charge.

p. Explosive. Explosives are classified as low or high depending on the rate at which the reaction of explosion takes place. The rates of transformation of explosives into gas vary over a wide range.

(1) *Low explosives as compared with high explosives.* One group of explosives, which includes propellant and black powder, is classified from the viewpoint of use characteristics as "burning" explosives. This group undergoes autocombustion at rates that vary from a few centimeters per minute to 400 meters per second; these are known as low explosives. A second group, which includes TNT, Compositions A, B, and C, PETN, nitroglycerin, and many others, is classified from the viewpoint of use characteristics as "high" explosives. This group undergoes detonation at rates from 1,000 to 8,500 meters per second.

(2) *Propellants.* A propellant is an explosive (solid or liquid) that is suitable for effecting the controlled propulsion of a solid body such as a bullet, shell, rocket, blast-driven earth rod, or a moving part in a mechanical device. As disruption of the propellant container must not take place and as the movement of the object propelled must be controlled, the explosive process of the propellant must be controlled. Because of these requirements, only low explosives are suitable for use as propellants. However, some solid propellants are presently considered to be high explosives.

q. Firing Pin. A pointed metal plunger in the firing mechanism of a fuze or of a firing device (fig. 33) that, when released, strikes a sensitive explosive in a primer or detonator and explodes it. A firing pin is sometimes called a striker.

r. Firing Device. A small metal case or body (figs. 27–36) containing a firing pin mechanism and primed coupling base to which a blasting cap, igniter, or activator may be attached. Firing devices are used to initiate the explosion of demolition blocks and as secondary antitank mine fuzes. A firing device is issued separately. When assembled with a detonator, it may be used as a mine fuze, antilift device, or to set off prepared charges.

s. Firing Mechanism. That part of a firing device consisting of a firing pin assembly and its housing.

t. Fuse, Blasting, Time. Commercial-type waterproof cord (fig. 22) that has a corrugated surface and contains a core of black powder and is fabricated to provide delay for safety purposes. It is sometimes called a safety fuse (*ac* below). It is used only with nonelectric blasting caps or black powder igniters (squibs). The burning rate of a 1-foot length should be tested before using.

u. Fuze. A mine fuze is a complete assembly issued with a mine. It always contains a means of detonation and is normally used in primary fuze wells.

v. Fuze Well. Opening in a demolition block to receive a firing device or other priming arrangement.

w. Galvanometer. An instrument (fig. 42) for determining whether there is any current and, therefore, whether the circuit is closed.

x. Kit. A specific collection of equipment, tools, and explosives (fig. 52) used for performing certain particular demolition tasks or with inert simulated explosives for training personnel. The term "kit" is also used to designate a group of items, which together are a component of a set.

y. Lighter, Fuze. A small tubular device containing a friction compound and hand-pull friction wire or containing a firing pin and primer (figs. 20 and 21); used for attachment to and ignition of time blasting fuse or safety fuse M700.

z. Primer. A small cylindrical metal casing (fig. 37), used in a firing device, containing an internal cup filled with a very sensitive high-explosive and an anvil arranged so that, when the cup (showing at one end of the primer) is struck by a firing pin, the explosive is detonated and flame is spurted from the other end for the purpose of exploding a detonator or an igniting charge. Primers may also be actuated by friction or electric spark.

aa. Protector, Shipping. The small celluloid or cardboard cup-shaped cover (fig. 29) with which the nipple of the coupling base of a firing device is protected during shipment.

ab. Safeties. Organic safety devices (those incorporated in design) (fig. 3) characteristic of all fuzes and firing devices to help prevent accidental functioning. Their removal, as in the case of safety cotter pins, constitutes the process called "arming."

ac. Safety Fuse. Military-type waterproofed cord that has a smooth plastic cover and contains a core of black powder and is fabricated to provide delay for safety purposes. It is marked at 18-inch intervals to correspond to a burning time of 1 minute. The 18-inch intervals are rough and provide a means for measuring the fuse in daylight and darkness. It is used only with nonelectric blasting caps or black powder igniters (squibs).

ad. Set. A specific collection of explosives initiators, primers, equipment, and tools, used for performing particular demolition tasks or tasks supplementary thereto.

ae. Shaped Charge. A mass of high-explosive having a shaped metallic- or nonmetallic-lined recess that causes it to have a one-way penetrating action known as "MUNROE effect." It is used to blast boreholes in steel, concrete, or similar materials or may be used to

penetrate explosive-filled objects to induce a low order functioning, if the shaped charge is of appropriate size.

af. Snake, Demolition. An elongated and somewhat flexible fabricated metal container having a pear-shaped guiding nose and a body containing high-explosive charges (fig. 67). The snake is assembled in the field and manipulated into position, by a tank, among various obstacles or in an enemy mine field and there exploded by appropriate fuze arrangements in order to clear a path for troops or vehicles. Upon functioning, a trough-shaped path some 325 feet long, 4 to 12 feet wide, and 2 to 4 feet deep is made, depending on the character of the soil.

ag. Sympathetic Detonation. One which is induced by the explosion of another charge.

ah. Torpedo, Bangalore. An explosive device (fig. 16) consisting of any desired number of slim cylindrical explosive charges in metal containers. Any number of these containers may be attached to each other endwise. It is used against barbed wire and various other relatively light obstructions.

ai. Destructor, High-Explosive, Universal. The universal high-explosive destructor is a high-explosive charge initiated by means of blasting caps or mine activators and standard firing devices. It is used in preparing loaded projectiles and bombs as improvised mines, booby traps, and demolition charges. It is also used by disposal units to destroy deteriorated or abandoned ammunition.

6. Demolition Complete Round

a. Definition. A demolition complete round consists of all the components in one system of explosives, ranging from the initiating element to the element designed to accomplish the demolition. A complete round may be issued with all components in separate compartment of the same packing container or group of containers or with certain components shipped separately for assembly in the field.

b. Explosive Train. The main explosive charge of a demolition system must be comparatively insensitive, in order to permit safe handling in large quantities in storage and in transit. To insure high-order detonation of this charge, explosives of various degrees of sensitivity, such as in primers and detonators, must be used in conjunction with it. These sensitive explosives, when properly arranged, can be detonated with a lighter or a detonator. They are necessary only in relatively small quantities in an explosive system and, in some cases, are inclosed in a metal container. The most highly sensitive of these explosives in a system is in smallest quantity. When it is initiated, flame thereby produced is not ordinarily powerful enough to detonate the main explosive charge with high-order detonation. Therefore, one or more intermediate explosives are interposed in order of increasing quantity whereby a decreasing order of sensitivity is adequate. Thus, a succession of explosives is arranged progressing from a highly sensitive small quantity to a less sensitive larger quantity to a still less sensitive still larger quantity ending with the least sensitive and largest quantity, which is the main explosive. Such an arrangement of explosive charges is called an explosive train. However, sensitivity is not the only requirement of an explosive in the explosive train. It is also important that the explosion travels from the less powerful to the more powerful explosive. Delay elements are sometimes incorporated between two explosive train components to meet certain delay action requirements.

7. Classification

Demolition materials are classified as to composition as explosive or nonexplosive. They are classified as to use as service or training.

8. Identification

a. General. Demolition materials are identified by standard nomenclature, lot number, model, painting, marking, and ammunition identification code symbol. Such means of identification are associated with all packing containers and, unless the item is too small, on the item itself.

b. Ammunition Lot Number. When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. The lot number consists, in general, of the loader's initials or symbol, the assigned interfix number, and the serial number of the lot. The parts of the lot number are separated by dashes. This lot number is stamped or marked on every item and on all packing containers. It is required for all purposes of record, including reports on condition, functioning, or accidents in which the ammunition may be involved. In any one lot of ammunition, similar components used in assemblies are manufactured under as nearly identical conditions as possible.

c. Model. To identify a particular design, a model designation is assigned at the time the item is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature and is included in the marking on the item. The present method of model designation consists of the letter "M" followed by an Arabic numeral. Modifications are indicated by adding the letter "A" and appropriate Arabic numeral. Thus, M1A1 indicates the first modification of an item for which the original model designation was "M1." Modifications that are functionally identical with the original model but which have manufacturing differences may be designated by "M1" followed by the letter "B" and an Arabic numeral, for example, M1B1. When a particular design has been accepted only for a limited procurement and service test, the model designation is

indicated by the letter "T" and an Arabic numeral and modifications by the addition of "E" and an Arabic numeral. In such cases, if the design subsequently should be standardized, an "M" designation is assigned; hence, there may be encountered some lots still carrying the original "T" designation (not yet remarked to show the later standardized "M" designation). There is no direct relationship between the numerical designation of a "T" item and that of the item when standardized and assigned an "M" designation. The present method of model designation for Navy items is "Mk" (signifying "mark"); modifications are indicated by "Mod 0," "Mod 1," "Mod 2," etc.

d. Painting. Service demolition materials, except some plastic materials, are painted to prevent rust and in various colors to provide a means of identification. Service explosive demolition materials are painted lusterless olive drab with marking in yellow. Inert demolition materials, which are used in training, and nonexplosive demolition materials, except certain tools are painted black with marking in white. Some items of practice demolition are painted blue.

e. Marking. Demolition materials are marked by stamping or stencilling with the type, size, model, and lot number.

f. Data Card. The ammunition data card is a 5″ x 8″ card prepared for each lot of ammunition. Copies are forwarded with each shipment of ammunition. In addition to the ammunition lot number, the data card gives the lot numbers of the components and other pertinent information concerning the ammunition. The data card is a basic document in the surveillance and use of the item to which it pertains.

g. Ammunition Identification Code (AIC). An ammunition identification code is established in order to facilitate requisitioning and record keeping in the field. The AIC symbol consists of five characters, the first two of which indicate the standard nomenclature list (SNL) in which the item may be found, the other three are peculiar to the item. Once a code symbol is properly assigned to an item and published, it is never assigned to another item. Further explanation of the AIC symbol may be found in ORD 1 (sec. I) and in TB 9–AMM 5.

9. Care, Handling, and Preservation

a. General Precautions.

Warning: Explosives and components containing explosives MUST be handled with appropriate care at all times. The explosive elements in primers, blasting caps, and fuzes are particularly sensitive to shock and high temperature. The use of the modern more highly sensitive explosives renders it especially necessary to follow the precautions herein and in TM 9–1900.

(1) Demolition explosives and related items are packed to withstand conditions ordinarily encountered in the field, being packed for shipment and storage in moisture-resistant containers and suitable packing boxes. However, they must not be handled roughly. Care must be taken to keep packing boxes and containers from being broken, cracked, or dented. Some specialized items may lose part of their effectiveness if distorted. If packing boxes and containers should become damaged, they must be repaired immediately and careful attention given to transferring all effaced parts of markings due to the damage to their proper places on the new parts of the box. If airtight containers are broken, they should be resealed and tested, if equipment for testing is available.

(2) Since explosives are adversely affected by moisture, and may become deteriorated or metal containers corroded to the point of unserviceability, they should not be left at any time in damp places. Moisture-resistant seals of containers must not be removed until just before the contents are to be used.

(3) Explosive materials must be protected at all times from all sources of excessive heat, including direct rays of the sun. All storable military materiel must be susceptible of safe storage and transportation without permanent impairment of its capabilities from the effects of temperature. The temperatures for storage purposes are: Lower limit, −80° F for periods of at least 3 days duration; upper limit, 160° F for periods as long as 4 hours per day. Temperatures of this order (160° F) are encountered within unventilated containers, inclosures, shelters, freight cars, closed vehicles, etc., when the structures themselves are exposed to an air temperature of about 125° F, plus full impact of solar radiation, 360 Btu per square foot per hour, for periods of approximately 4 hours daily.

(4) Demolition materials should be protected from mud, sand, dirt, and water. If they become wet or dirty, they should be cleaned at once, including removal of any verdigris or other corrosion.

(5) Demolition materials prepared for use but not used will be returned to their original condition and packings and appropriately marked. Such materials will be used first in subsequent operations, in order that stocks of opened packings may be kept to a minimum.

(6) Black powder must be kept dry. Components containing it should be stored in a dry, well-ventilated magazine. Black

powder is extremely flammable and must be carefully guarded against sparks and flame.

(7) Do not attempt to disassemble any initiating component, such as a primed coupling base with or without igniter or blasting cap fitted thereto.

(8) Do not remove protective or safety devices from firing devices until just before use.

(9) Containers of explosives must not be opened in a magazine.

(10) Blasting caps should not be stored assembled to detonating cord or any high-explosive charge.

(11) Storage compatibilities and quantity-distance regulations in TM 9–1900 will be observed. Where appropriate in oversea commands, the storage provisions of FM 9–6 should be used.

(12) Smoking or bringing an open flame near explosives is not permitted.

b. Safety Distance Requirements for Preparation of Primers and Demolition Charges. It is extremely important that personnel take adequate precautions to prevent accidental explosions while preparing primers for demolition activities. In addition to the general safety precautions currently in force, the safety rules for the preparation of primers and demolition charges in (1) through (14) below will be strictly observed.

(1) Test-burning of safety fuse or time blasting fuse for determination of rate of burning of the roll will be done at a minimum safety distance of 25 feet from exposed blasting caps or explosives in the direction toward which the air current is moving.

(2) Cutting square across end of safety fuse or time blasting fuse, remove and discard 2 or 3 inches of fuse from each roll.

(3) Cut off and test a 1-foot length from each roll for determination of burning time. *All fuse in the same roll should burn at a uniform rate, though the rate of burning of time blasting fuse may vary from approximately 30 to 45 seconds per foot in different rolls.*

Note. The standard fuse is FUSE, safety, M700, which is marked at 18-inch intervals that correspond to a burning rate of 40 seconds per foot.

(4) The supply of blasting caps for a required operation will be at a minimum of 25 feet from the supply of explosives.

(5) The preparation of nonelectric blasting caps will be performed not less than 25 feet from the supply of blasting caps or explosives.

(6) Cut sufficient safety fuse or time blasting fuse to permit firer to walk to a place of safety before the charge explodes.

(7) Do not use any blasting caps other than issue special blasting caps, nonelectric (type I) or electric (type II), for detonating military demolition material without first testing them to determine that they will adequately initiate the explosive. Weaker caps (of commercial type) may fail to initiate a detonation, resulting in scattering the charge, breaking it up, or starting a fire.

(8) Select one nonelectric blasting cap, hold it open end down, and shake *gently* to remove dirt or other foreign matter. Hold the desired length of safety fuse or time blasting fuse vertical and gently slip the cap down over the fuse until the explosive in the cap is in contact with the end of the fuse. If the fuse appears too large to enter the blasting cap easily, the end to enter the cap may be rolled lightly or merely pinched lightly between the fingers to restore the symmetry of the fuse.

Caution: Do not use force.

(9) When the fuse is properly seated within the blasting cap, use a cap crimper to crimp the cap at the open end; hold the fuse between the thumb and third finger of the left hand and extend the forefinger over the end of the cap when crimping cap to fuse. Crimp cap near its open end; a crimp too near the explosive in cap may detonate it. As a safety precaution, point cap out and away from body while crimping.

(10) No more than 10 blasting caps will be permitted at the site selected for preparation of primers at any one time.

(11) The priming of explosives will be performed at a distance of not less than 25 feet from the site of any other permissible storage or operation point involved in connection with the preparation of primers and demolition charges.

(12) Not more than one primed charge of explosives will be permitted at any site at any one time.

(13) The preparation of primers and the priming of explosives will not be performed in advance of requirements for use of same, in view of possible atmospheric effects.

(14) Bring to the site of the operation only sufficient explosives to meet the requirement of the operation involved.

c. Dynamites. Dynamites freeze at low temperatures rendering them entirely undependable until thawed. Frozen dynamite *must* be thawed before using. A two-compartment thawing kettle (fig. 4) is used. Place water in a separate container, make it as hot as can be borne by the hand, and pour it into the water compartment. Place the dynamite in the explosive compartment, laying each stick on its side in a position so air can circulate readily around it. Place the kettle in a barrel or box and surround it with dry hay or similar

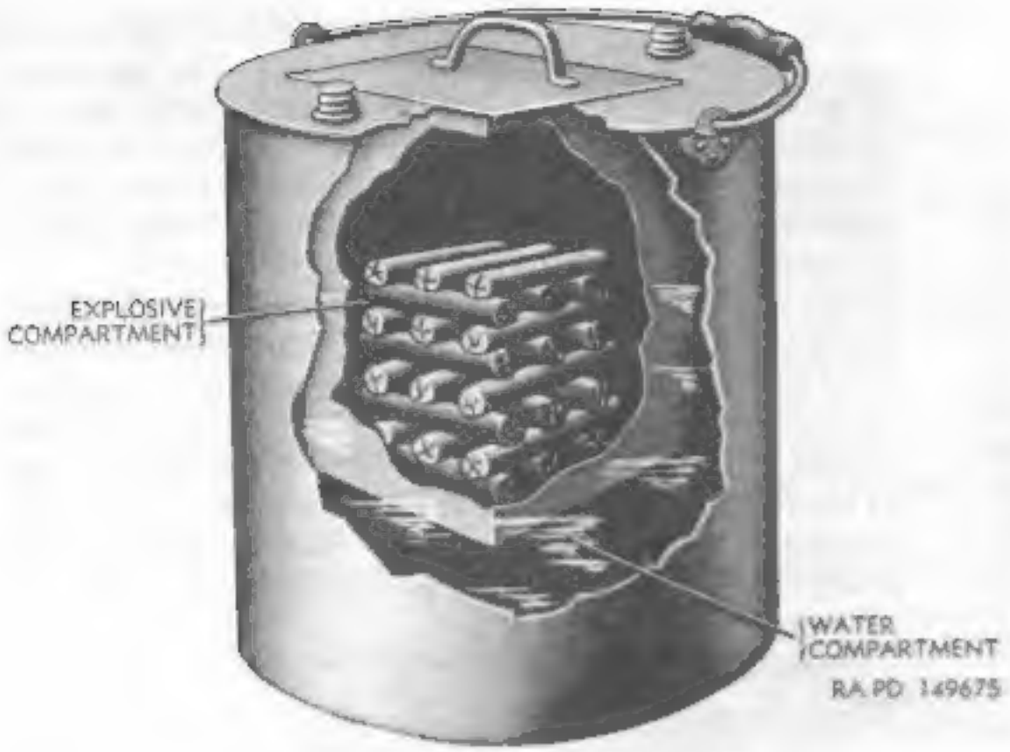

Figure 4. Dynamite-thawing kettle.

insulating material. Thaw no more than 50 pounds of dynamite in one lot. *Never* place the dynamite in the explosive compartment before pouring the water into the water compartment of the kettle. *Never* place the kettle over heat after the dynamite is in it.

10. Destruction of Unserviceable Demolition Materials

a. General. Demolition materials that have been designated for destruction as unserviceable will be destroyed, in general, as prescribed in TM 9–1900.

b. Destruction by Burning or Detonation. Destruction of unserviceable demolition materials (other than dynamite and black powder) by burning or detonation may be accomplished in essentially the same manner as the demolitions described in paragraphs 120 and 121.

c. Unserviceable Dynamites.

(1) *Commercial dynamite.* Commercial dynamite that has deteriorated from age has a dark color and is soft and mushy. Their packing cases are often discolored by dark brown stains. Such dynamites are extremely sensitive and should not be used but should be destroyed by burning. Packing cases should not be opened to remove the cartridges for destruction. Place the unopened packing cases of dynamite on a bed of combustible material such as excelsior or hay. Ignite the combustible as described in paragraph 121. Exuding dynamite has an oily emission (nitroglycerin) on the cartridges and on the packing cases. The packing cases should be opened carefully and the individual cartridges should be placed on a bed of combustible material. The cartridges should be placed on the combustible bed in a single layer, not greater in width than the length of one cartridge. When destroying dynamite by burning, the possibility of detonation always exists. Whenever possible, personnel should withdraw to a distance equal to the "inhabited building distance" based on the quantity of dynamite being destroyed (see quantity-distance tables in TM 9–1900). Dynamite awaiting destruction, especially during hot weather, should be shielded from the rays of the sun. Frozen dynamite is more likely to detonate during burning than dynamite at normal temperatures.

(2) *Military dynamites.* Military dynamites are very stable and are not expected to become soft and mushy or to exude. However, if they become unserviceable, they should be destroyed in the same manner as exuding commercial dynamite ((1) above).

d. Black-Powder-Loaded Components. These components can best be destroyed by burning in a hot fire or by dumping into a suitable stream of water (if not prohibited by law).

11. Handling Inert Demolition Material

The same basic safety rules should be followed when using inert training or lecture aids as prevails when the fully loaded items are being used; striking, dropping, or handling in other than the manner prescribed for explosive loaded (live) items should not be permitted. Personnel should be cautioned to treat all inert-loaded demolition materials and components of demolition materials as requiring the same degree of caution as their explosive-loaded (live) counterparts. In order to make inert items readily identifiable, several holes are drilled or cut in them where practicable. In addition, they are stamped and/or stencilled "EMPTY" if they have *no* filling and "INERT" if they have an *inert* filling. (For further information, see SR 385–410–1.)

12. Preparation of Demolition Materials for Firing

a. The burning rate of safety fuse or time blasting fuse should be tested prior to use.

b. In testing lengths of less than 2 feet, the burning time of the length to be used in service must not be merely estimated, but determined by a trial with the same length of fuse under the same conditions of altitude and confinement as expected for service use.

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c. The use of the same manufacturer's brands of electric caps in the same circuit will produce more uniform results, see paragraph 63.

d. The short-circuiting tab on the lead wires of electric blasting caps must be removed prior to connecting the caps into a firing circuit.

e. Charges for electric firing should not be primed or connected during a thunderstorm or if a thunderstorm is approaching.

f. Static electricity accumulates on many kinds of ungrounded objects. If allowed to accumulate to a sufficient extent that a spark should jump across an air gap in the presence of highly flammable material, a source of ignition might be provided. To eliminate this hazard, electrically continuous paths to ground, called "grounds" must be provided so that static charges will be continually dissipated. Therefore, all piles and stacks of explosive materials should be wired to grounded objects such as water pipes or metal rods driven into the ground.

g. Blasting caps should be crimped *only* with the cap crimper to insure a proper joint.

h. Do *not* crimp a blasting cap anywhere except very close to the open end.

i. Blasting caps weaker than the one prescribed to detonate the explosive being used should not be used. Weaker caps may cause misfires. If only less powerful caps are available, test shots should be made to determine how many of them are required to insure detonation.

j. Nonelectric blasting caps in underwater charges or charges placed in wet boreholes should not be used, see paragraph 65.

k. Safety fuse or time blasting fuse should not be cut short. For training purposes, less than 18 inches of fuse should not be used except in training for combat where practice with short lengths is required; in this latter case, token charges should be used.

l. Where lengths of safety fuse or time blasting fuse shorter than 2 feet are used, do not bend or mash the fuse and allow fuse powder to spill from the cords, as this may speed up the burning rate.

m. Do not use wire, a nail, or other similar instrument to remove blasting caps from the cap box. Nonelectric blasting caps, which are not easy to lift from the cap box with the fingers, should be handled by tilting the box into the palm of the hand until one cap begins to slide out. Withdraw this cap carefully. Keep cap box covered when not withdrawing caps.

n. Before crimping a nonelectric blasting cap to safety fuse or time blasting fuse, examine the end of the cap for foreign substance. In case of foreign substance in the cap, blow lightly into the open end of the cap. If this does not remove it, use another cap.

o. Do not force, bend, or twist the safety fuse or time blasting fuse in the blasting cap, as such action may fire the blasting cap.

p. Before lighting a safety fuse or time blasting fuse make sure that no other explosive charges or blasting caps are close enough to allow the flame from the lighted fuse end to reach such explosive charges or caps.

q. When lighting safety fuse or time blasting fuse, be sure that it is ignited properly before leaving it; this may be determined by the characteristic smoke and heat. In case of a nonelectric misfire where explosives are involved personnel will not approach the pit, trench, or point of misfired charge until a period of 30 minutes has elapsed.

r. Use dual-firing systems (see FM 5–25), if practicable, in order to increase the likelihood of a successful operation and to minimize the danger of unexploded charges being left hidden, tamped in the ground, or left unrecovered in shallow water.

s. When conducting training operations with demolition charges, training should be given (w/appropriate safety measures), in priming demolition charges with both single and dual systems of blasting cap-and-detonating cord firing, time blasting fuse-(safety fuse) and-blasting caps firing, electric current-and-blasting cap firing, and combinations of these and electric-firing systems, see FM 5–25.

t. In training or testing, *do not* use larger charges, shorter lengths of fuse, or greater exposure of personnel than is necessary for the purpose of the training or test.

u. Primed explosive blocks or cartridges should not be forced into a drill hole (borehole). Charges should be tamped only with blunt wooden tamping sticks; no tamping should be done with steel bars or tools.

v. Lead wires of electric blasting caps should not be connected to a blasting machine until ready to fire the charge; they should not be left attached to a blasting machine after charge is fired. When using a blasting machine, it should be operated vigorously.

w. Do not reload immediately after exploding a charge to spring a borehole. Wait until the hole is cool enough to prevent premature explosion of the second charge. Cool the hole with water if necessary.

x. Tape the connection between blasting cap and safety fuse or time blasting fuse when using a piece of fuse shorter than 1 foot. The taping prevents the flash of a fuse lighter from spitting directly into the cap.

y. When preparing to fire electrically, the one individual to do the firing will retain possession of the blasting machine and/or its handle *at all times* until he has fired the charge.

z. Do not allow any instructions or any set of rules to take the place of *care* and *thought* in carrying on demolition work.

aa. Electric blasting caps and electric blasting circuits may be energized to dangerous levels from outside sources, such as static elec-

tricity induced electric currents, radio communication equipment, high-tension wires, and the like. Safety precautions, therefore, shall be taken to reduce the possibility of a premature initiation of the electric blasting caps and explosive charges of which they form a part. Short wave radios must not be operated (either sending or receiving) within one-fourth mile of an electrical blasting or demolition operation and electric blasting caps must not be used within 1 mile of broadcasting or high-power short wave stations. These distances apply to all parts of the operation, including the lead wires of the cap and the firing wire circuit. Before connecting electric blasting caps to the firing wires, the blasting circuit shall be tested to determine if hazards from stray currents are present. A dummy test circuit, essentially the same as the actual blasting circuit except that a No. 47 radio pilot lamp of known good quality inserted in place of the blasting cap, shall be used without applying electric current to the circuit. If any glow of the radio pilot lamp is observed when viewed in darkness, electric blasting caps must not be used and nonelectric caps and safety fuse substituted. Other suitable instruments, such as the DuPont "Detech-A-Meter," may be used to test the circuit for stray current in lieu of the method described above. If the instrument shows the presence of stray currents, electric blasting caps shall not be used.

13. Misfires

A misfire is a complete failure to function. A hangfire is the failure to function until an abnormal lag beyond the instant of initiation has occurred, see SR 385–310–1.

a. Causes of Misfires and/or Hangfires.

(1) Electric or nonelectric blasting caps too weak to detonate explosive.
(2) Deteriorated safety fuse or time blasting fuse, detonating cord, or explosive charge.
(3) Improper electric or nonelectric connections.
(4) Improper operation of blasting machine.
(5) Weakened blasting machine.
(6) Failure to make sure that the safety fuse or time blasting fuse has been lighted.
(7) Improperly made priming materials.
(8) Damaged electric or nonelectric firing circuits.
(9) Use, in the same circuit, of electric caps made by different manufacturers.
(10) Attempting to fire too many electric caps in same circuit.

b. Prevention of Misfires and/or Hangfires. Care in placing charges, in making up and placing priming systems, and in connecting

firing circuits will prevent many misfires and hangfires. In most cases, the use of dual firing systems (FM 5–25) renders investigation unnecessary, as one of a pair of properly made up and connected electrical circuits or nonelectric arrangements is almost certain to detonate their charges.

c. Electric Misfires. Misfires of charges primed with electric blasting caps may be investigated immediately unless the charges are also primed nonelectrically. Upon occurrence of a misfire, several successive attempts should be immediately made to fire the electric blasting caps. Should these attempts fail, the connections of the firing wires to the terminals of the blasting machine should be checked, then three more attempts to fire should be made. If the circuit still fails to fire, wait 1 minute, disconnect the firing wire from the blasting machine and check the entire circuit, including firing wire, for breaks or short circuits; see FM 5–25 on testing circuits. If the fault is traced to a break or short circuit of wires below the tamping, for example, beneath the surface in a borehole, great care must be taken to avoid striking the electric blasting cap while removing the tamping material. Do not attempt to remove either the cap or the charge. If the fault is not located by removing the tamping to within a foot of the charge, place a new charge of 2 pounds of explosive with a new blasting cap at this point. Disconnect the wires of the original blasting cap from the circuit, connect the wires of the new blasting cap in their place, and replace the tamping. Detonation of the new blasting cap should then detonate the original charge.

Caution: Do not investigate immediately electrical misfires if the charges are also primed with nonelectric cap and fuse or with detonating cord that is being fired nonelectrically. Delay the investigation until the nonelectric circuit has fired the charges. If the nonelectric circuit misfires, delay the investigation as indicated in *d* below.

d. Nonelectric Misfires. Nonelectric misfires may be divided into two types: charges primed with time blasting fuse (safety fuse) to initiate a nonelectric cap and charges primed nonelectric cap to initiate a detonating cord.

(1) *Charge primed with time blasting fuse (safety fuse) and nonelectric cap.*

(*a*) If a charge primed with time blasting fuse (safety fuse) and nonelectric cap fails to fire, delay investigation until at least 30 minutes after the charge should have fired, as it may be a hangfire. After the lapse of 30 minutes, it may reasonably be considered a misfire.
(*b*) If the misfired charge is not tamped, install a new blasting cap. If it is tamped, remove the tamping to within about 1 foot of the charge, place a new charge of 2 pounds of explosive with a new blasting cap and new safety fuse or

time blasting fuse at this point and replace the portion of the tamping that was removed.

(*c*) If practicable, place additional primed charges near enough to the misfired charge to detonate it rather than disturb the original time blasting fuse (safety fuse), because disturbing the fuse might cause a possible smoldering section in the fuse to resume normal burning.

(2) *Charges primed with detonating cord.*

(*a*) If a nonelectric blasting cap is used to fire a detonating cord, but the cap fails to detonate, delay investigation at least 30 minutes. After the lapse of 30 minutes, cut the detonating cord main line between cap and charge and fasten a new cap to the detonating cord.

(*b*) If an electric blasting cap is used to fire detonating cord but the cap fails to detonate, follow the procedure set forth in *c* above. If necessary, and practicable, fasten a new blasting cap on the detonating cord.

14. Storage of Demolition Materials

a. Temoprary Magazine Locations.

(1) Accessibility, safety, dryness, and good drainage determine the magazine location. An isolated ravine is a good location if it is not subject to flash floods from heavy rains and cloudbursts. When single magazines are not isolated or where magazines are built in groups, each magazine should be surrounded with breastworks or baffle walls to minimize damage to adjacent structures in case of an explosion and to protect magazines from bomb and shell fragments.

(2) TM 9–1900 gives the distances at which magazines should be located from other magazines, buildings, and routes of communication.

b. Temoprary Magazine Construction.

(1) Temporary magazines made of heavy sheet iron sections are the most satisfactory, but care must be taken to prevent them from becoming too hot if exposed to the sun, particularly in hot climates. This may be done by using a double roof, the lower roof being of lumber and the upper roof of metal supported above it to leave space for free circulation of air between the two. If a single roof of sheet iron is used, some protection against intense heat is gained by painting the outer surface with aluminum paint.

(2) The types of structures described in (*a*) through (*d*) below may be used to accommodate moderate stocks of explosives.

(*a*) A chamber excavated in a dry bluff and timbered to prevent caving.

(*b*) An isolated house or shed.

(*c*) A light wooden frame erected on the plan of a box house with a wedge roof and covered with lightweight corrugated iron.

(*d*) A light wooden frame as described in (*c*) above covered with a tent or with canvas paulins.

c. Field Storage. In overseas commands and combat areas, the storage provisions of FM 9–6 should be observed.

d. Operation. Magazine operation should be based on the precautions in (1) through (12) below.

(1) Blasting caps will not be stored in the same magazine with other explosives. Primed demolition blocks or cartridges will not be kept in a magazine.

(2) Older explosives will be shipped first. Stocks should be arranged so that old stocks will be most readily accessible.

(3) Safety hand tools (nonsparking) must be used in buildings and at operations involving loose or bulk explosives, exposed explosives, and in the presence of hazardous concentrations of flammable gases and vapors.

(4) Matches, fire, nonsafety lamps, or spark-producing devices will not be allowed in a magazine.

(5) Cases of dynamite and any other nitroglycerin explosives will be stored right side up, not on sides or ends, so the cartridges will lie horizontally.

(6) Miscellaneous material will not be stored in a magazine with explosives.

(7) The grounds aroiind magazines should be kept free from brush, dry leaves, or grass. A fence, preferably of barbed wire, should be erected around a magazine area.

(8) Packages of explosives may be opened only at a distance of not less than 100 feet from a magazine or dump.

(9) Shoes having exposed nails, metal plates, or cleats will not be worn in a magazine. Regulation safety shoes should be worn in magazines.

(10) Explosives should be stacked on planks or wooden mats for ventilation and protection against moisture. Explosives will not be stored in a damp place.

(11) Explosives will not be handled or stored in or near occupied buildings.

(12) Commercial dynamite should be turned periodically depending on temperature; see paragraph 35.

15. Transportation

Transportation of explosives by rail or truck in the United States is regulated by Interstate Commerce Commission Regulations for Transportation of Explosives and other Dangerous Articles by Freight, published by the Bureau of Explosives. Obtain a copy of the regulations and follow them exactly: see AR 55–157 and AR 55–470.

16. Packing and Marking for Shipment

a. Packing data for demolition materials are given in Department of the Army Supply Manual ORD 3 SNL R–7.

b. In addition to nomenclature and lot number, packages offered for shipment are marked with the Interstate Commerce Commission shipping name or classification of the article, volume and weight, the Ammunition Identification Code Symbol, and the Ordnance Corps escutcheon.

CHAPTER 2

EXPLOSIVE CHARGES

Section I. GENERAL

17. Types

The items described in this chapter consist of military explosives, such as trinitrotoluene (TNT), ammonium nitrate, nitrostarch, COMP C series explosives, tetrytol, pentolite, and similar explosives, in various sizes and shapes used as demolition charges and blocks in military demolition operations. Commercial dynamites used in military demolition operations are also described. Demolition explosives may be used as improvised land mines. On the other hand antitank mines as well as artillery shell and bombs may be used for demolition. For tactical employment of demolition materials described in this manual, see FM 5–25.

18. Characteristics

a. Requirements of demolition explosives for efficient and safe operation are a minimum of sensitivity, including insensitivity to bullet impact yet sufficient sensitivity to be positively detonated by simple initiators, relatively high detonation rate and power consistent with required insensitivity, storage stability at temperatures between −80° and 165° F., suitability for underwater use, and of optimum size and shape for convenient handling.

b. Characteristics used to aid in determining the appropriate explosive for a given operation are listed in table I. As general rules, the relative effectiveness of an explosive is proportional to the detonating rate, the high detonating rate explosives are more effective for the more intensive operations, such as cutting steel or breaching, and the lower detonating rate explosives are more effective for the bulkier operations, such as cratering.

Table I. Characteristics of Principal Explosives Used for Demolition

Name	Velocity of detonation (fps)	Relative effectiveness as external charge (TNT=1.00)	Value as cratering charge	Principal uses	Smallest cap required for detonation	Intensity of poisonous fumes
TNT (demolition blocks)	21,000	1.00	Good	General use in forward areas.	Special blasting cap, electric or nonelectric.	Dangerous.
Ammonium nitrate (cratering charge)	11,000	0.42	Excellent	Cratering	Special blasting cap, electric or nonelectric.	Dangerous.
Nitrostarch	15,000	0.86	Good	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous
Composition C2	26,000	1.34	Fair	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous.
Composition C3				Same as TNT		
Composition C4				Same as TNT		
Tetrytol	23,000	1.20	Fair	Same as TNT	Special blasting cap, electric or nonelectric.	Dangerous.
Straight dynamite	40%=15,000 50%=18,000 60%=19,000	40%=0.65 50%=0.79 60%=0.83	Good	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Dangerous.
Ammonia dynamite (extra).	40%= 9,000 50%=11,000 60%=12,000	40%=0.41 50%=0.46 60%=0.53	Excellent	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Dangerous.
Gelatin dynamite	40%= 8,000 50%= 9,000 60%=16,000	40%=0.42 50%=0.47 60%=0.76	Good	Land clearing, cratering, and general use in rear areas.	No. 6 commercial cap.	Slight.
Military dynamite (M1, M2, and M3).	20,000			Land clearing, cratering, and general use in rear areas.	Special blasting cap, electric or nonelectric.	

Section II. DEMOLITION BLOCKS

19. Block, Demolition, Chain, M1 (Eight 2½-Lb. Blocks)

a. General. This explosive charge (fig. 5) consists of eight blocks of tetrytol strung on a 16-foot length of detonating cord (primacord) and packed in a haversack. It is provided primarily for demolition purposes. The entire chain, or any part of the chain, may be used laid out in a line, wrapped around an object, or as packed in the haversack. Since tetrytol is more powerful and more brisant than TNT (par. 23), this explosive is more effective in cutting steel and in demolition work. The blocks and detonating cord are comparatively insensitive to shock, but the assembly, which includes a tetryl pellet, is slightly more sensitive than TNT (par. 23). The detonating cord is detonated by a blasting cap or a detonator. Simultaneous detonation of unconnected blocks can be obtained when separated by as much as 10 inches of air.

b. Description. Each block of the eight blocks is rectangular in shape, 11 x 2 x 2 and enclosed in a crinkle-kraft paper bag. The blocks are cast in place on the detonating cord with 8 inches between blocks and 2 feet of detonating cord at each end. The charge is 75/25 tetrytol, with a cylindrical pellet of tetryl cast in each end of each block. Printed on the paper bag covering in at least one place is the designation: "BLOCK, DEMOLITION, CHAIN, M1 (TETRYTOL). MUST BE DETONATED BY ORDNANCE CORPS U.S. ARMY BLASTING CAP. ONE BLOCK=SIX ½-LB TNT BLOCKS."

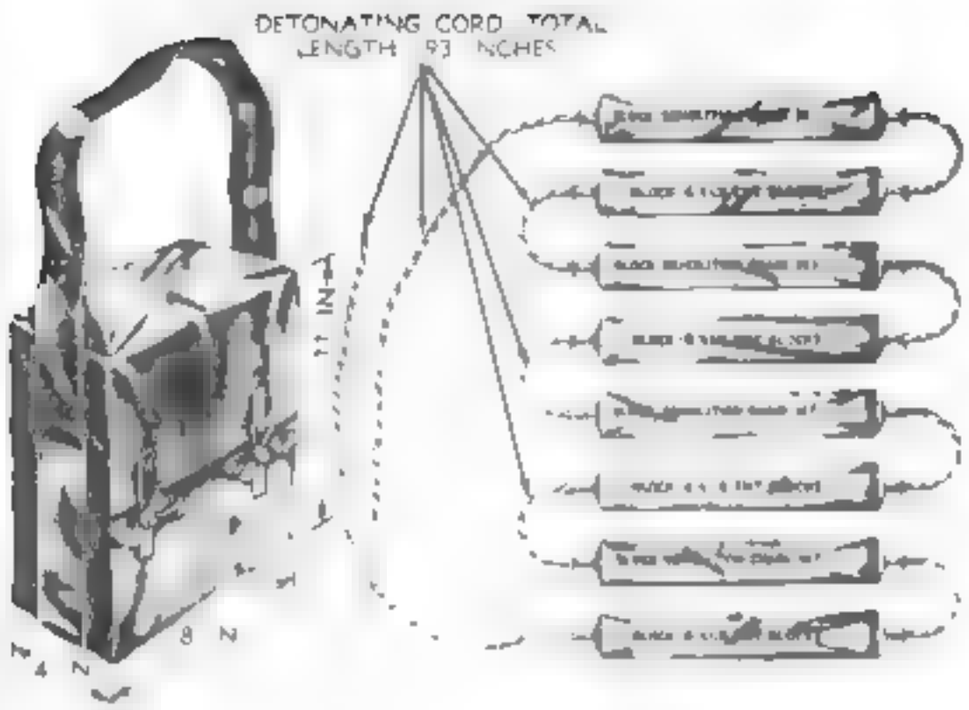
c. Packing. One chain is packed in a haversack, two haversacks (two chains) per box. The dimensions (in.) of the haversack are approximately 12½ x 9 x 4½, and its weight as packed is 22.5 pounds.

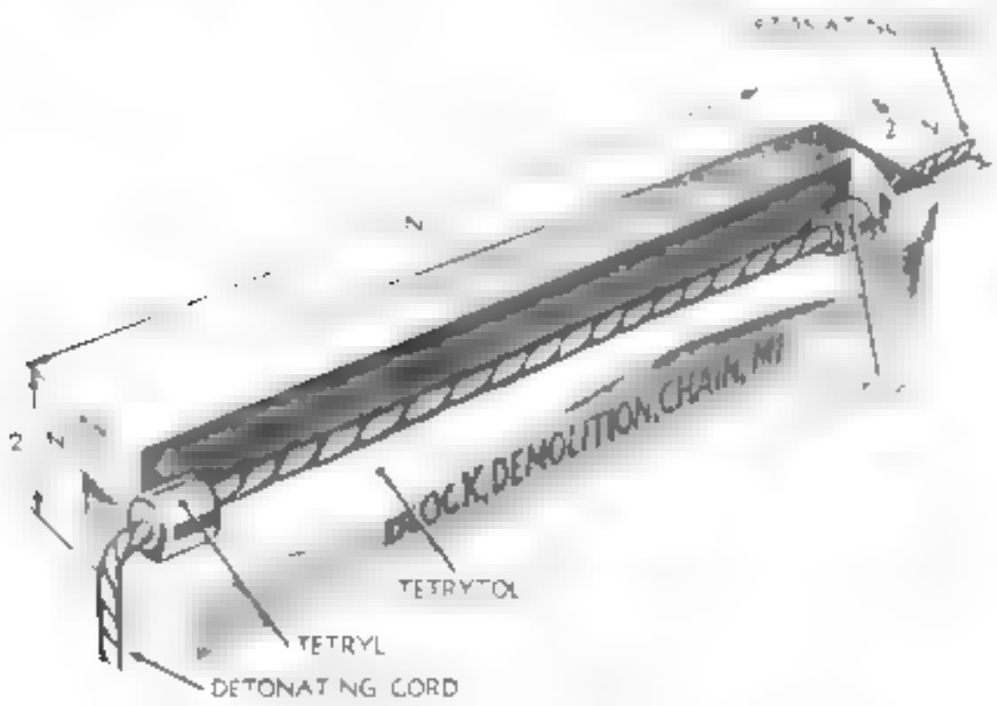
20. Block, Demolition, M2

a. General. Demolition block M2 (fig. 6) is similar to one of the eight blocks of BLOCK, demolition, chain, M1 (par. 19), except that, instead of a central core of detonating cord, there is a detonator well in each end.

b. Description. This demolition item is a block measuring 11 x 2 x 2. Each detonator well is threaded at the outer end to receive any standard firing device or a priming adapter. At the inner end of each well, there is a tetryl pellet cast in the block to act as a booster. Each block is wrapped in olive drab paper on which is printed: "BLOCK, DEMOLITION, M2 (TETRYTOL). MUST BE DETONATED BY ORDNANCE CORPS U. S. ARMY BLASTING CAP. ONE BLOCK SIX ½-LB TNT BLOCKS."

c. Packing. Packing is similar to that of the eight-block chain of demolition block M1. Eight demolition blocks M2 are packed in a haversack, two haversacks (16 blocks) per wooden box.





ENLARGED SECTIONED VIEW OF BLOCKS USED IN CHAIN

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Figure 5. Block demolition chain M1 and carrier, bag, ammunition, for chain demolition or for high and ideal demolition, M1. M1 or M1A1.

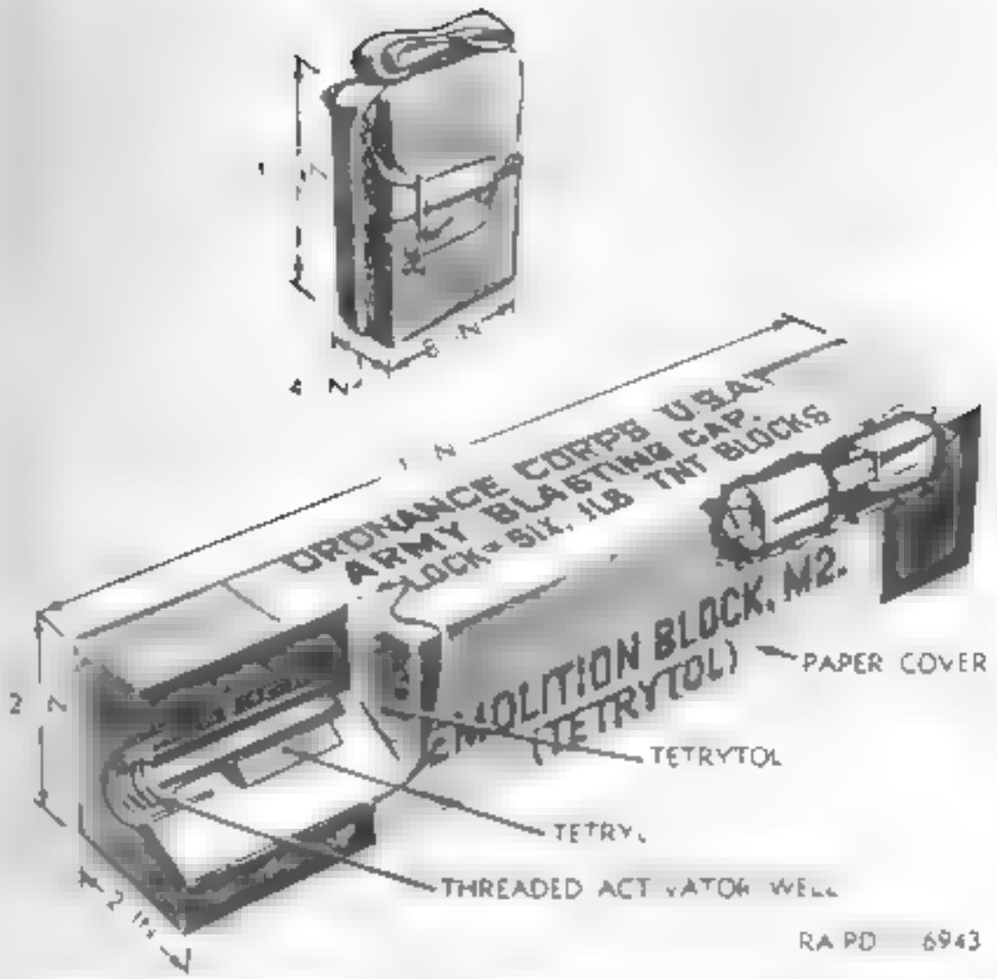


Figure 6. Block demolition M2, enlarged sectioned view and carrying box, sack for eight blocks.

21 Block, Demolition, M3, COMP C2, and Block, Demolition, M3, COMP C3

A frozen 1-pound block of COMP C2 or C3 is rectangular in shape and consists of plastic explosive, 11 x 2 x 2. They are pliable and may be molded at temperatures between 2° and 70° F. However, compositions charges are not easily handled at temperatures below freezing, although body heat will keep the material pliable, and fired gases will ignite silver aged charges. COMP C2 and COMP C3 are more powerful than TNT and have excellent water resistivity. The plasticity of the material permits it to be easily handled and packed into irregular spaces, thereby giving high demolition efficiency. Being insoluble in water, blocks of COMP C2 or C3 are suitable for underwater demolition. It may be fired by detonating cord tied in a double knot, with the plastic explosive molded into a ball around the knot.

b Precautions

1) These compositions must not be exposed to open flame, as they ignite easily and burn with intense heat. If burned in large quantities, they may explode.

2) They should not be stored in snow or ice, because they become brittle, nor above 125° F, because they exude some of their oils. They may exude some oils at ordinary temperatures, but this does not materially affect the insensitivity or other characteristics.

3) They are dangerous to use in closed spaces because they produce poisonous gases when exploded.

Packing. The blocks M are wrapped in glazed paper and packed in a labeled, olive-drab cardboard carton perforated around the center, so that it may be removed to make room for the blocks as they are fired. Twenty-four blocks are packed in a wooden box.

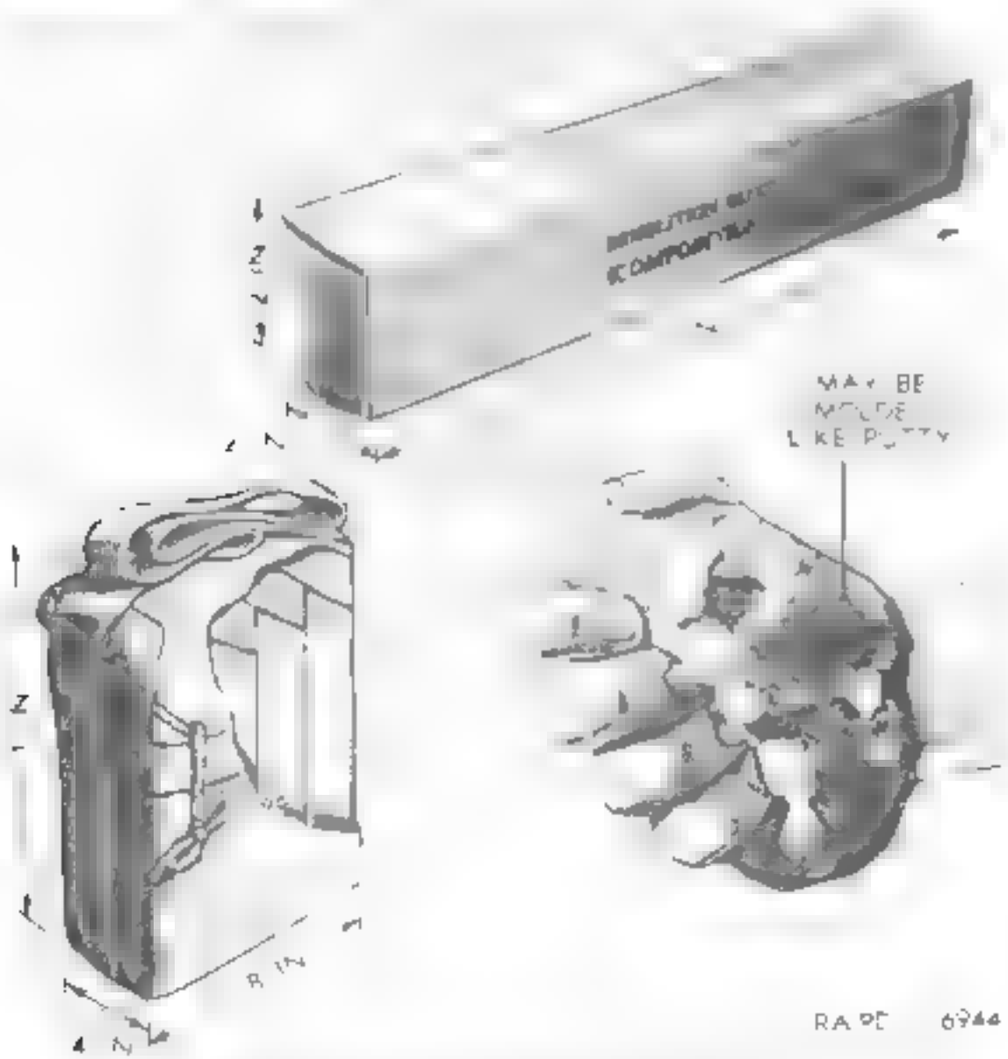


Figure 7. Block, demolition, M5A1 (COMP C4)

22. Block, Demolition, M5A1 (M5E1)

This block is slightly larger than the M5 block in size and shape, and weighs 2½ pounds. It is composed of plastic explosive composition C4. It is pliable and may be easily molded at temperatures between 70° and 170° F. Composition C4 is slightly more powerful than C3 and about the same degree of sensitivity to detonation. This block is used in demolition kit M5A1 (par. 101).

23. Explosive, TNT, ½-Pound Block

a Description. This block is a prismatic TNT, a powerful high explosive, having many uses in general demolition operations, for cutting and breaching. It is issued in the form of a compressed pressed block. It may be fired in the open or in a confined space with equal effectiveness. If the latter is used to destroy a hard target, a tamping material of sufficient weight to prevent the gases from escaping should be placed over the charge. Although it may be exploded when wet, it is not recommended for use in water. If it is to be used in water, it should be fired as soon as possible after it is placed in the water. The block is square in cross section and has a hole through the center lengthwise. A cap well is molded in one end of the block to receive the detonator. The block is packed with a waterproof base. A blasting cap, electric or nonelectric, is required to initiate the block. The detonator may be attached to the charge with a length of safety fuse.

b Uses and Precautions.

(1) TNT should not be used for cutting steel because it is explosive at low temperatures.

(2) TNT should not be exposed to open flame because it is highly explosive. Use only special electric blasting caps, Type II, for TNT or CAP, blasting, special, electric, Type II, for TNT. Use only ordinary nonelectric blasting caps for TNT.

c Packing. Two pressed blocks are packed in a wooden box.

24. Explosive, TNT, 1-Pound Block

This block is the same as the ½-pound block except that it is larger in size and weight. The pressed block consists of two 1-pound blocks packed in a cardboard container. Each container is sealed with a waterproof paper tape. The pressed block is fired by placing a blasting cap in the cap well of one block and covering over a priming adapter, part number or any standard priming device.

25. Explosive, TNT, 8-Pound Block

This block is made of cast TNT, and is 2 x 6 x 12 in. size. It is packed in a wooden box, and is fired by a blasting cap and a waterproof [illegible]

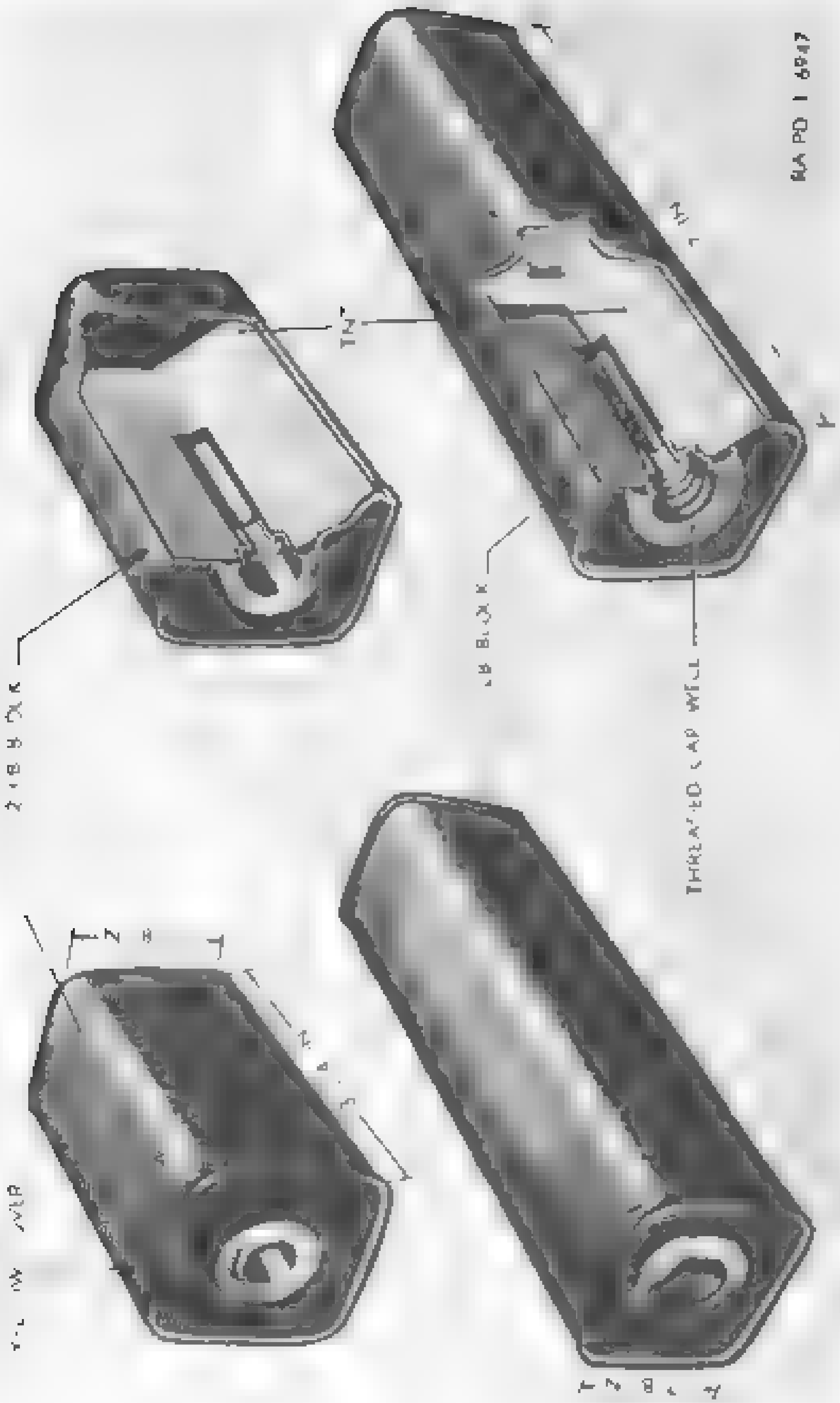


Figure 8. Explosive, TNT ½ pound block and explosive, TNT 1 pound block.

ment the waterproofness inherent in barrier material. Each block is surrounded by filler material to [illegible] shocks incurred during overseas shipment. The ½ pound block is used as a charge [illegible] to [illegible] M5A2, and for any suitable military demolition purposes in [illegible] or with other explosives that are [illegible] high order detonation [illegible] TNT.

26. Explosive, Nitrostarch, 1-Pound Block

a. Description. [illegible] (fig. 9) consists of [illegible] blocks of nitrostarch, each with a hole through its center. Groups of three blocks are [illegible] package. Four of these [illegible] packages are [illegible] wrapped [illegible] package. The blocks are [illegible] package that the central holes form [illegible] through the [illegible] package. These [illegible] are marked by circles on the paraffin-treated outside wrapper. Nitrostarch is slightly less powerful than TNT [illegible] 25 [illegible] the same use.

b. Priming. The 1-pound nitrostarch block [illegible] (fig. [illegible]) by [illegible] through the wrapper [illegible] of a [illegible] wrapper [illegible] through the [illegible] and tying a knot in the end of the cord to keep it in place. The cord may then be [illegible] M2, by [illegible] delay detonator M1, or by a [illegible] that [illegible] fuse [illegible] fuze lighter.

c. Special Precautions.

(1) General precautions in handling explosives [illegible] but it must be emphasized that nitrostarch is more sensitive to flame, friction, and impact than TNT or tetrytol. The blocks must not be broken or [illegible].

(2) Blocks may explode if struck sharply.

(3) Blocks do not always explode with [illegible] less powerful than [illegible] CAP [illegible] electric (type II) [illegible] PETN [illegible].

(4) Nitrostarch [illegible] therefore [illegible] be kept dry. Nitrostarch is somewhat soluble in water [illegible] properly if used under water.

(6) Nitrostarch is not recommended for use [illegible] spaces because the explosion produces poisonous gases.

d. [illegible]. The 1-pound blocks are packed [illegible] per wooden box.

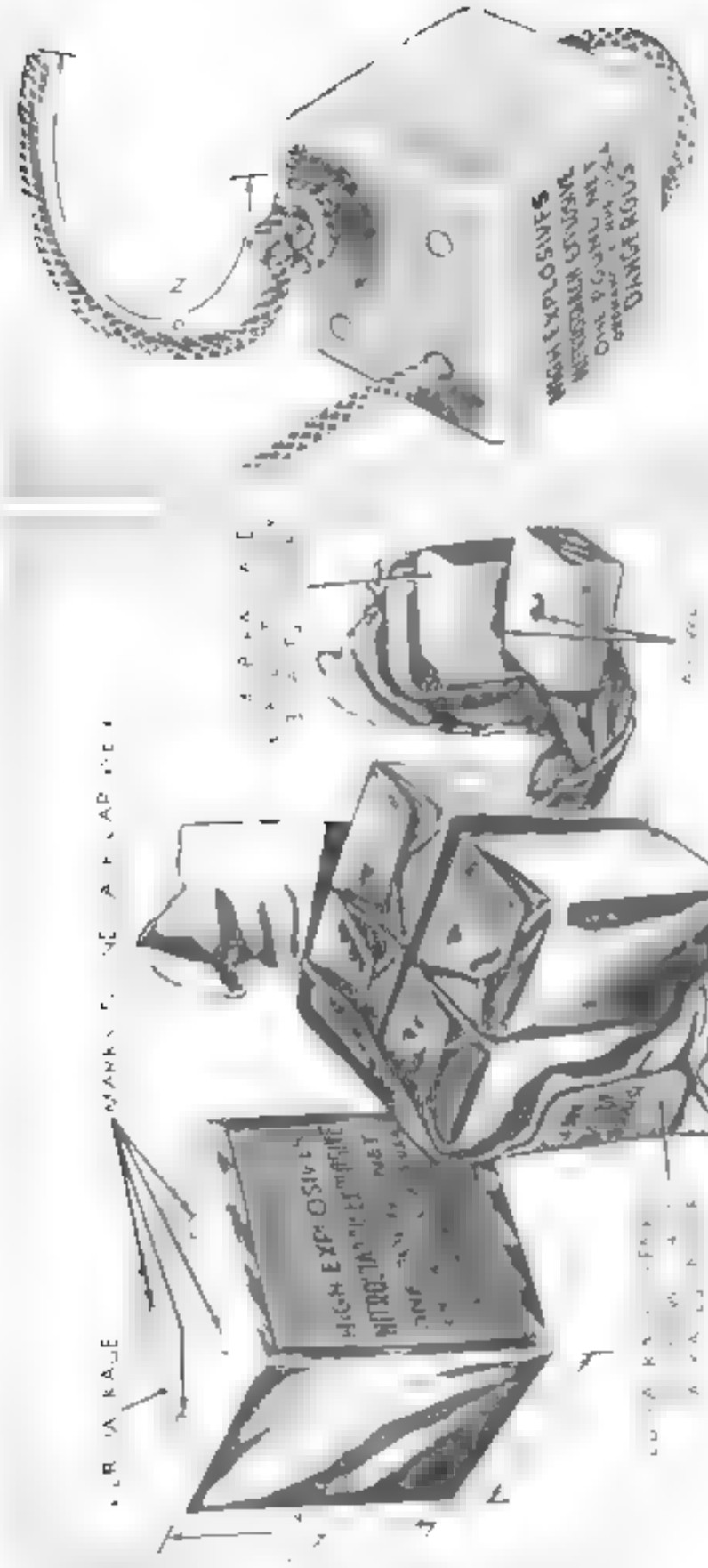


Figure 9 Explosive nitrostarch, 1 pound block

Section III SHAPED CHARGES

27. General

[illegible] concrete, and similar material. Maximum penetration of a shaped [illegible] for by a fiber sleeve or metal legs supporting the charge at [illegible] a half times the diameter of the charge. A carrying strap is attached to the charge for suspending it in a horizontal position for [illegible]

28 Special Precautions in Use

In using shaped charges, the precautions in *a* through *h* below should [illegible]

[illegible] be tied, taped, or propped in place.

c. The proper stand-off can be obtained by using the legs or pedestal [illegible]

Table II. Penetration of Shaped Charges

Model number of shaped charge	Reinforced concrete					Armor plate				Remarks
	Perforation[1] (in.)	Perforation[2] (in.)	Diameter of hole (in.)			Perforation (in.)	Diameter of hole (in.)			
			Entrance	Average	Minimum		Entrance	Average	Minimum	
M2A3	36	30	3½	1½	2	12	3½	1½	2	A second charge will increase concrete penetration to 45 inches. A second charge placed over the first hole will increase concrete penetration to at least 7 feet.
M3	60	60	5	2½	2½	20	5	2½	2½	

[1] Thickness of wall that can be perforated with charge.
[2] Depth of penetration when thickness is too great for perforation.

h. When shaped charges are used to blast boreholes for two-stage demolitions, care should be taken to allow the hole to cool sufficiently before loading the second demolition charge into the hole.

29. Charge, Shaped, 15-Pound, M2A3

a. Description. This charge (fig. 10) contains approximately 12 pounds of 50/50 pentolite, or COMP B with a 50/50 pentolite booster, in a moisture-resisting molded fiber container. The charge may be used in wet locations without deformation of the case. The top of the charge has a threaded cap well for receiving a blasting cap and adapter or any standard firing device. A cylindrical fiber base slips on the end of the charge, to hold the charge at the proper stand-off distance. A cone of glass is used as a cavity liner in this charge. This charge will pierce 36 inches of reinforced concrete (4,000 to 5,000 psi compressive strength) or in a wall of greater thickness will produce a hole 30 inches deep and 2 to 3½ inches in diameter.

Figure 10. Charge, shaped, 15-pound, M2A3.

b. Packing. The shaped charge M2A3 is packed three per box; four per carton and two cartons (eight charges) per box; or four in a fiber container, one container per box. As packed, the charge is nested in its cylindrical base.

30. Charge, Shaped, 40-Pound, M3 (T3)

a. Description. This charge (fig. 11) contains approximately 30 pounds of 50/50 pentolite, or COMP B with a 50/50 pentolite booster, in a metal container. The cavity liner is made of metal. A threaded cap well is provided for receiving a blasting cap and adapter or any standard firing device. A metal tripod for gaging correct stand-off distance is shipped unassembled, but nested with the charge in the same container. This charge will penetrate 60 inches of reinforced

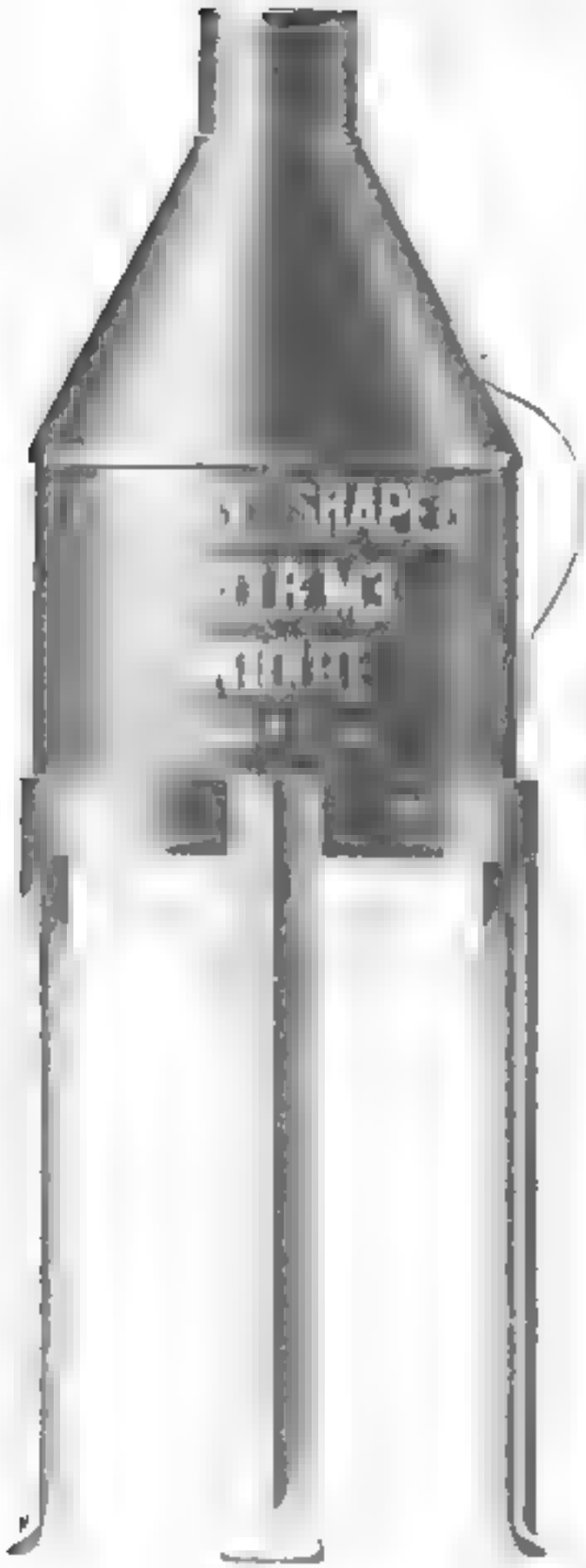


Figure 11. Charge shaped 40 pound M3

[illegible]

31. Container, Cavity Charge, Mk 2

a. Description. This container (fig. 12) consists of a body, a cone, [illegible]

Figure 12. Container, cavity charge, Mk 2

[illegible]

blasting cap inserted one quarter to three eighths of an inch into the center of the top of the explosive and with the axis of the hole parallel to the axis of the cylinder. A stick of the explosive pierced by the two wires is considered as the most likely to give consistent and under functioning of the explosive but care after a misfire or low order. The test may give values from the optimum to half values of the nearest and from the latest of the jet at least penetrates the explosive charge. If the shot misfires or detonates low order" after the first shot, a second shot may be made at a different ... using the same ... distance should be lessened by 2 inches on each successive shot until ... is a possibility that the explosive will detonate "high-order," hence ... as ... Many ... explosives ... of ...

... large containers. Most ... are packed in a wooden box. The ... mately 6 x 6 x 9½, weighing 20 pounds. The box is labeled to indi-

Section IV CHARGE, EXPLOSIVE, CRATERING, 40-POUND, AMMONIUM NITRATE, IN WATERPROOF METAL CONTAINER

32 Description

... large ... of ... waterproof ... cylinder ... diameter. The ... of the charge consist of a number of TNT ... for ... charge ... (safety fuse) and a blasting cap and a detonating cord tunnel for ... charge ... of the ... booster ... the cap between ... of ... at least 5 feet, ... charge ... line ... with a piece of ... for ... the ... with a piece of ...

33 Packing and Use

The ... charge ... The ... charge ... for ... The ... of different ... the ... for ...

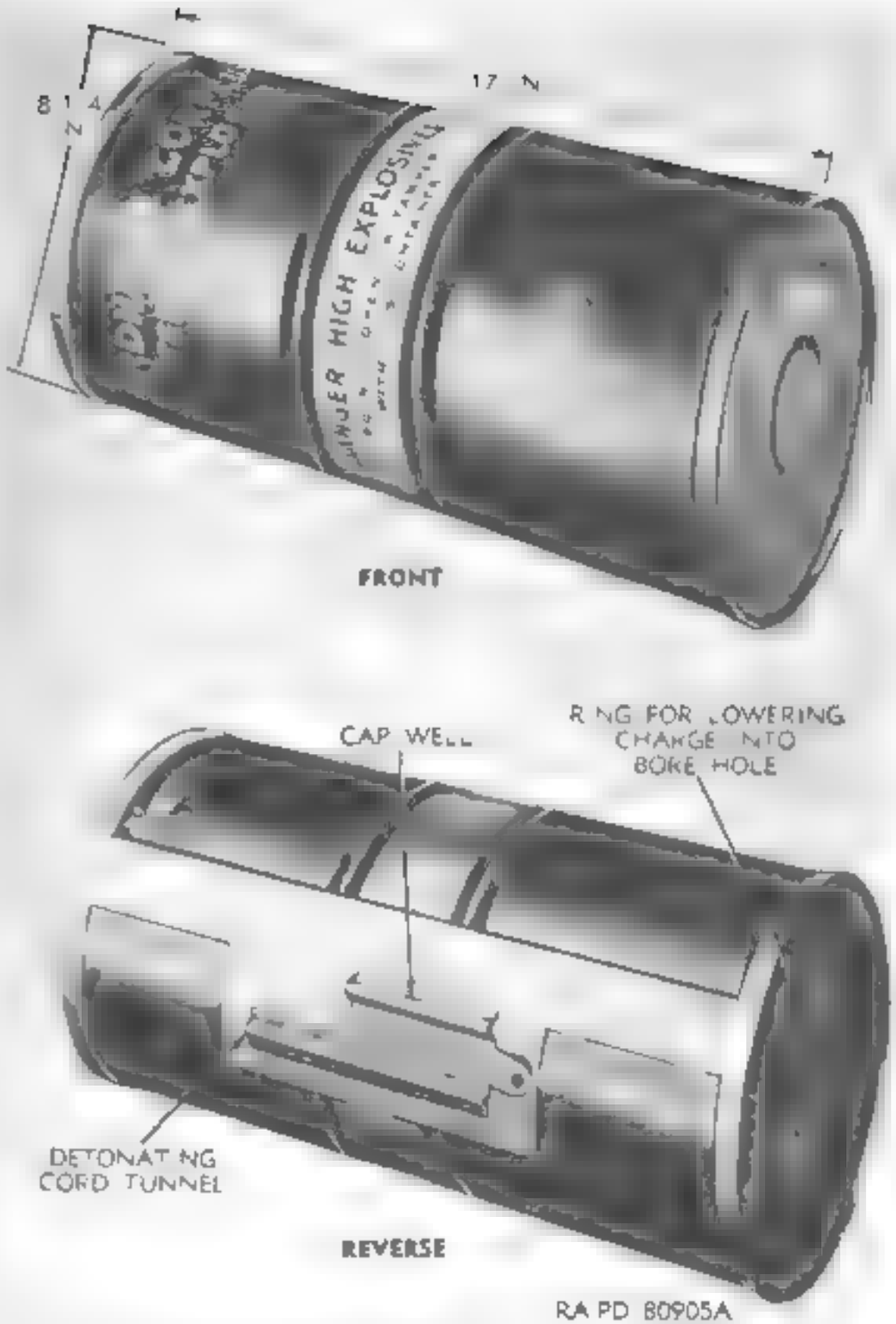


Figure 13. Charge, explosive, cratering, 40-pound, ammonium nitrate

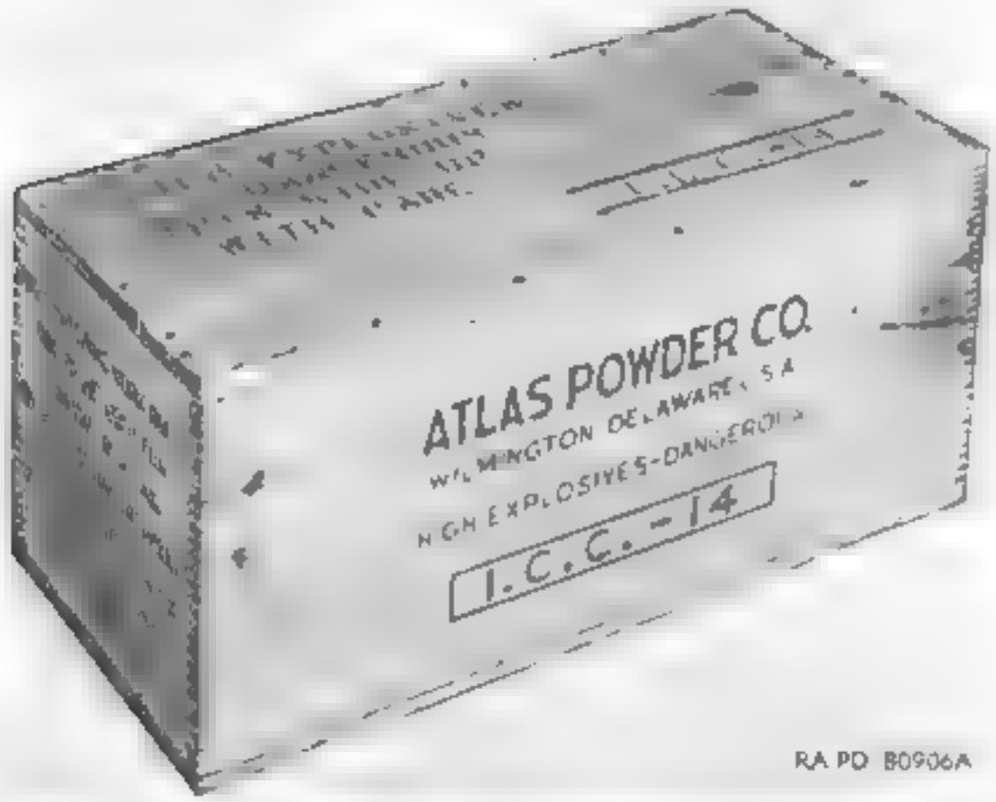


Figure 14. Charge, explosive, ordnance, 10-pound, ammonium nitrate, in fiber box

Section V. DYNAMITES

34. General

a. Commercial Explosives. Dynamites are used for military operations for demolition, excavation, and cratering. The most commonly used dynamites were available for this purpose. The types described for these operations are known as dynamite, gelatin, dynamite, straight, and dynamite. The percentage designation of some commercial dynamites is the percentage by weight of the nitroglycerin

content. Commercial dynamites may be exploded when primed with a No. 6 or larger blasting cap or by special blasting caps (para 63). Commercial dynamites are sold in 1/2-pound paraffin treated paper cartridges 1 1/4 inches in diameter by 8 inches long (fig. 1). For a complete description of the Army Supply Manual ORD SNL K-7 [illegible] for commercial explosives see TM 9-1910.

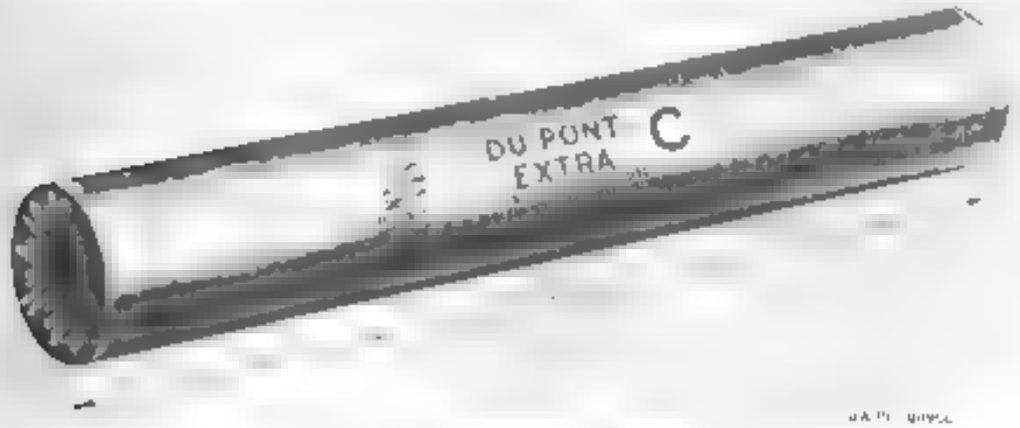


Figure 15. Dynamite cartridge

b. Military Dynamites. Two military dynamites are standardized. These explosives are for general use as demolition charges. They are packaged in paraffin treated waterproof cartridges for loading, quarrying, and other demolition work. They are available in the following sizes: 1 1/4 inches diameter by 8 inches long, 1 1/4 inches diameter by 16 inches long, and 2 inches diameter by 8 inches long. Military dynamites are packaged in standard demolition cartridge waxed paper wrappers. Cartridge dimensions are as follows—

Dynamite, military, M1, 1 1/4 inches diameter, 8 inches long
Dynamite, military, M1, 1 1/4 inches diameter, 16 inches long
Dynamite, military, M1, 2 inches diameter, 8 inches long

Military dynamites may be exploded when primed with special blasting caps.

35. Special Precautions

Dynamites must be handled with care because they may be exploded by flame, sparks from electrical equipment, high-velocity fragments from bullets, or shell fragments. Explosive fumes produced when dynamites are burned in confined spaces. As compared to 60 percent straight nitroglycerin commercial dynamite, military

tary dynamites are relatively insensitive to friction drop impact and rifle bullet impact. Since the nitroglycerin commercial dynamites tends to the bottom of the cartridges they should be turned in storage as in *b* below. Military dynamites do not contain nitroglycerin and do not need turning in storage.

a. General precautions in handling explosives (par. 9) apply. It should be emphasized that dynamite that has deteriorated from age or other causes should not be used but should be destroyed as described in paragraph 14. Dynamite that is frozen but otherwise serviceable will not be used until properly thawed (par. 9). In tamping charges do not use steel bars or tools; use only wooden tamping sticks.

b. Any stocks of straight dynamite 60 percent and over in strength, in storage will be turned at regular intervals as indicated by average storage temperature, in accordance with the following schedule:

Average storage temperature	*Interval to be turned*
Below 30° F.	Does not require turning.
30° to 60° F.	Every 4 months.
60° to 75° F.	Every 2 months.
Over 75° F.	Every 1 month.

Other types of dynamite, straight, ammonia gelatin and gelatin dynamites will not be turned in storage. However, once at the coldest part of the year, a representative sample will be selected from the containers examined for evidence of nitroglycerin exudation on the exterior of the cartridge. If exudation is found, the lot or lots involved will be reported on Ammunition Condition Report, SF Form 317, as for 7.62-mm. ammunition with recommendation for destruction.

Section VI. TORPEDO, BANGALORE, M1A1

36. General

TORPEDO, bangalore, M1A1 (fig. 15) consists of a group of connecting assembled steel tubes filled with high explosive which are used singly or in series with base sleeve and connecting sleeves for blasting a path through barbed wire entanglements or other obstructions or cutting in brambles. Most rate explosive charges where demolitions stakes M5 series are used. (See paragraphs 110 through 119.)

37. Description and Functioning

The loading assemblies (tubes) are 5 feet 1 inch in length and 1¾ inches in diameter, grooved, and capped at each end. The explosive in the tubes is packed with about 4 inches of TNT at each end. The total weight of explosive in each tube is about 9 pounds. Because of the loading assembly, the tubes are not threaded. Explosive cannot be any "issue" firing device with a blasting cap crimped thereto. The

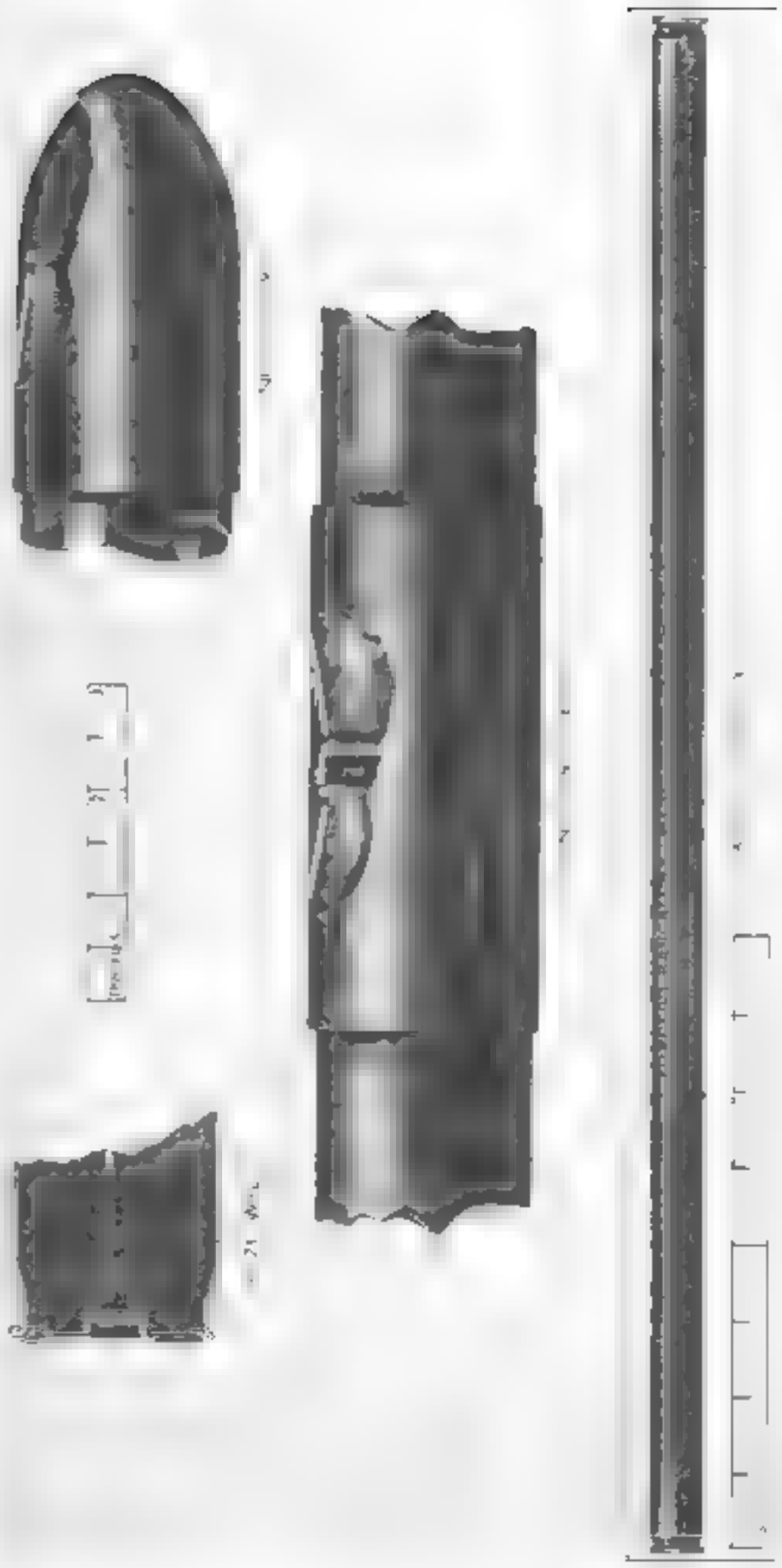


Figure 15. Torpedo, bangalore, M1A1.

...ose sleeve as a removal point at one end, for ease in pushing the tube or tubes through obstacles, and a groove, which holds the rose sleeve in place at the end of a tube. The connecting sleeve is an expanding coupling to which the ends of two tubes can fit and be held by the three spring clips. A single loading assembly can be used or any number of loading assemblies may be used as required. In assembling two or more tubes, a rose sleeve is pressed on the end of a tube, then the other end of this tube is connected to a second tube by a connecting sleeve and so on until the desired number of tubes are connected. Detonation of a charge in a tube or all charges in a series of tubes may be accomplished by a blasting device with blasting cap screwed into the cap well of the tail end of a tube or the tail end of the last tube in a series. Detonation may also be accomplished by an electric blasting cap with its leads connected to a source of electric current or by a nonelectric blasting cap attached to safety fuse or time blasting fuse and fuse lighter, or by wrapping a number of feet of detonating cord around the tube in the one to be assembly or around any two tube assembly and attaching the detonating cord to a nonelectric detonator with a specified safety arrangement, or by a safety fuse and time blasting fuse and fuse lighter.

38 Packing

TORPEDO barricade, M1A1 is packed in [illegible] for each carrying assembly, tubes, loading sleeves and rose sleeve.

CHAPTER 3

PRIMING AND INITIATING COMPONENTS, ACCESSORIES AND TOOLS

Section I. GENERAL

39. Priming

There are [illegible] used for detonating explosive charges. The [illegible] are designed to assure detonation of explosive charges at the [illegible] with explosive charges [illegible] explosive [illegible] materials [illegible] these items are explosive [illegible]

40. Materials

[illegible] materials consist of such materials as lead azide detonators, time blasting fuses, safety fuses, fuse igniters, fuse lighters, [illegible] and accessory items and tools used for assembling these materials are described in paragraphs [illegible]

Section II. DETONATORS

41. Detonator, Friction Igniter—Delay Type

a. General. Delay detonators are used for detonating explosive charges after a definite period of delay. The detonating delay system, a detonator and [illegible] parts of the unit. Table III gives the time of delay of [illegible] detonators [illegible] anticipated at a given temperature.

b. Second Delay Detonator.

(1) *Description.* The 8-second delay detonator (fig. 17) consists of a cylindrical shaped olive-drab plastic housing containing a pull wire coated with friction material. The pull wire is set in a flash compound. A tube set in the lower end of the housing contains a 8-second time fuse and a blasting cap. This igniter is used to delay the firing of detonation

Table III Temperature-delay for friction igniter detonators

Degrees F	8-sec delay detonator	5-sec delay detonator
140	7.8 to 9 sec	3 to 4.0 sec
100	8.6 to 9.6 sec	4.2 to 5.0 sec
60	9.5 to 10.2 sec	4.5 to 5.5 sec
20	10.4 to 11.2 sec	4.9 to 5.8 sec
−40	11.6 to 11.0 sec	5.5 to 6.5 sec

charges, particularly during assault operations. It is also used to fire underwater charges.

b. Instructions.

(1) With safety pin removed, pull on Tringa cable until wire to ring first contacted.

(2) Flash gutes (powder train).

(3) Eight seconds later, the delay element explodes the detonator. Length of cable between Tringa igniter and charge varies with tactical use from a few feet to 100 feet or more. Delay times of 5 to 7 seconds and 10 to 15 seconds also used.

c. Preparation for use.

(1) Remove protector cap.

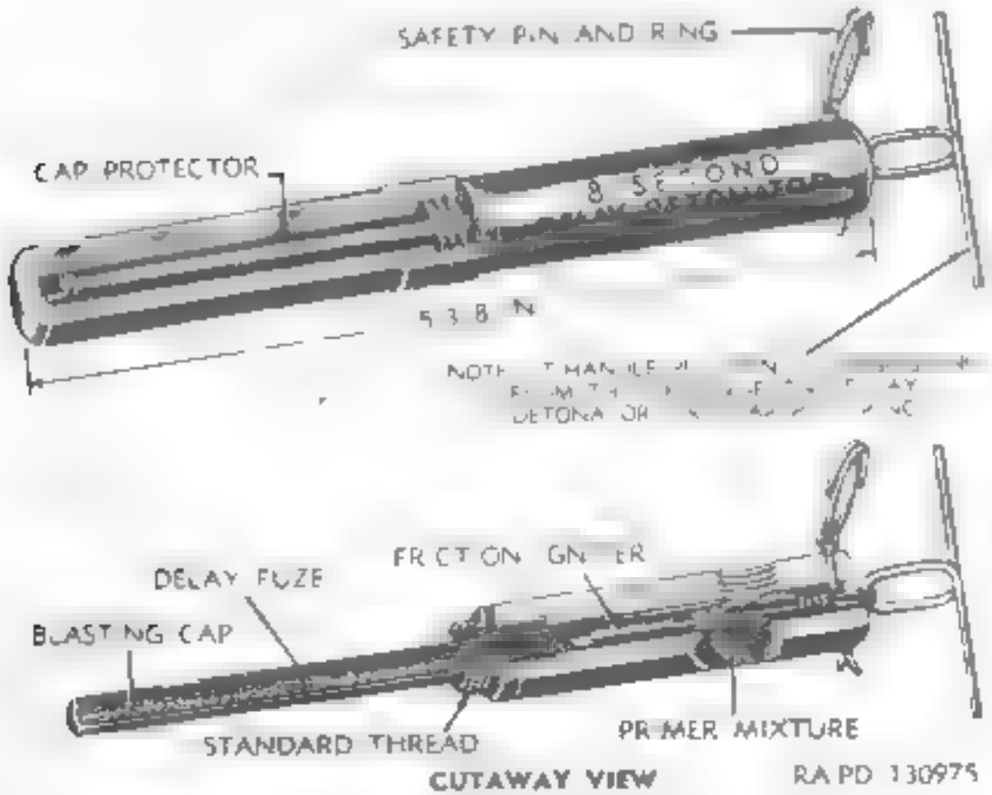


Figure 17 Detonator 8-second delay M2

(2) Screw detonator tightly into charge.

(3) Remove safety pin.

Pull Tringa cable to remove all slack and leave about 1 foot for attaching to firing device.

Caution. Once safety pin is removed any movement of Tringa cable will ignite powder flash and fuze. There is no warning as the powder train is short and fuze burns fast. Use care and practice in handling.

d. Misfires. The detonator and fuze can be safely removed if Tringa has not been pulled. If Tringa has been pulled, proceed as directed in handling duds below.

e. Duds and misfires.

(1) Unscrew detonator from charge.

(2) Cut off the Tringa cable at point where it enters detonator.

f. Packing and marking. Detonators are packed in individual boxes and 100 detonators per wooden box. Complete packing, weights, and marking

g. Description. The 8-second delay detonator M2 is identical to the 5-second delay detonator M1 except

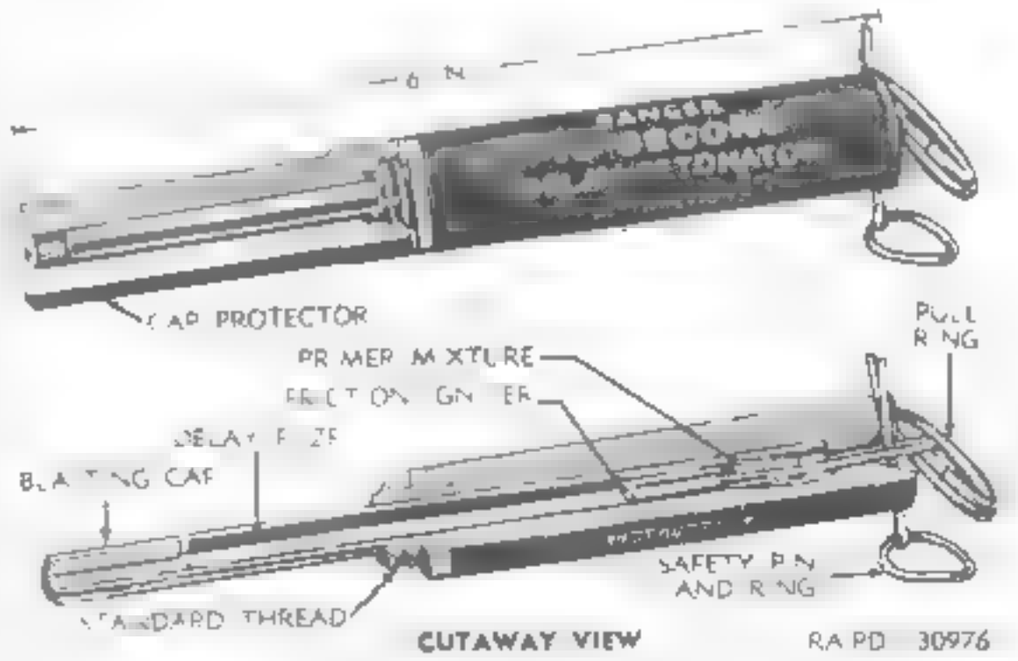


Figure 18 Detonator 15-second delay M1

are and [illegible] However the [illegible] are the powder delay train of seconds duration The detonator is used for similar purposes as for the second delay detonator Preparation for use receiving and [illegible] are the same as for the second delay detonator

2. *Packing and inspection.* Two hundred detonators are packed in a wooden box, complete packing weighs approximately 6 pounds

42. Detonator, Concussion—Delay Type

a. General.

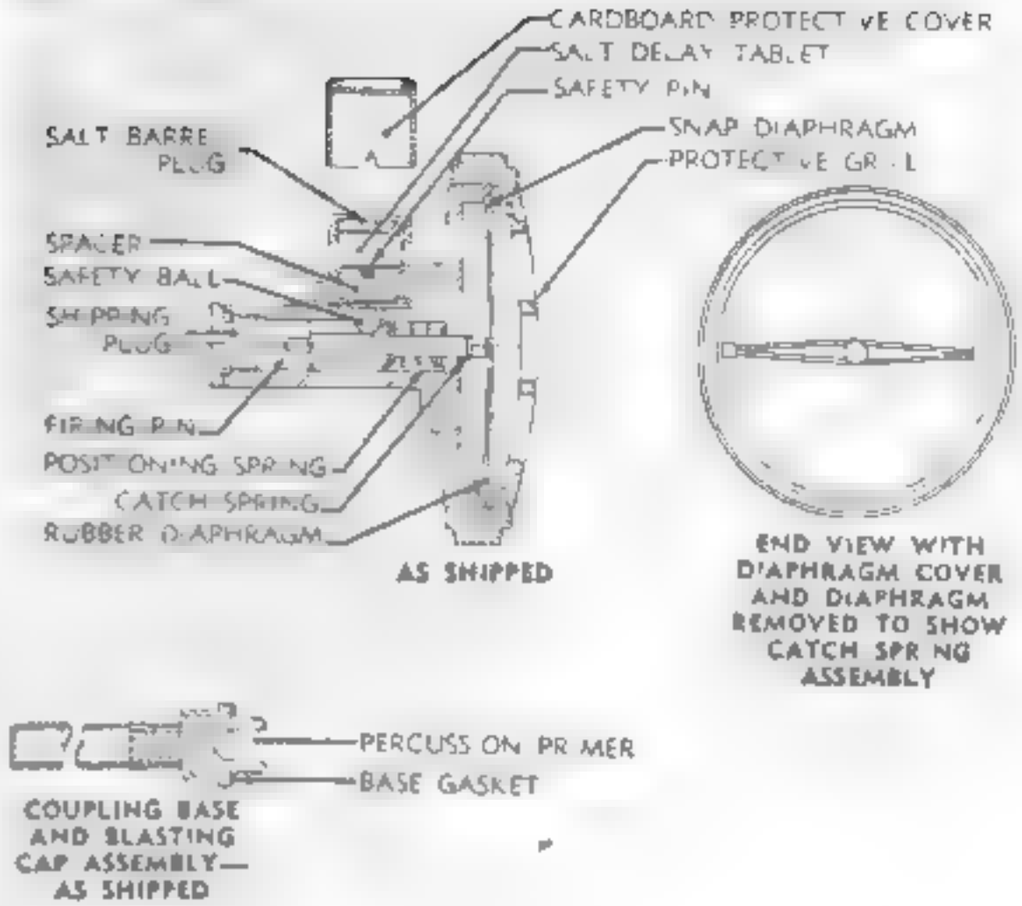
1. *Description.* The concussion detonator M (fig 19) is a mechanical firing device that is actuated by a compressive wave of water It can be used to fire several charges of explosives simultaneously without [illegible] charges with wires or detonating cord. A single charge fired in water or in air will detonate [illegible] charges equipped with [illegible] detonators within range of the shock wave of each other The detonator is designed [illegible] and can be used [illegible] in water

2. *Functioning.* The detonator consists of a firing pin type spring loaded striker, restrained by a safety ball Inadvertent release of the striker is prevented by a safety pin When the safety pin is withdrawn the firing spring pushes the striker forward The safety ball is displaced outward from the striker by the [illegible] and the striker is driven forward by the firing spring to detonate the primer

b. Preparation for firing Water

1. *Delay tablets.* To provide safety while arming the detonator in water, two water soluble time delay salt tablets are supplied with the detonator The [illegible] gives a delay of approximately [illegible] minutes and the yellow tablet approximately 7 minutes However since the dissolving time of the salt tablets varies with [illegible] conditions and water temperature tests should be made to determine the arming time before preparing and installing the charge The test is made by submerging the device to the proper depth under conditions similar to those anticipated in the actual operation and observing the dissolving time of the salt tablet.

2. *Assembly.* Since the salt tablets become soft before they are completely dissolved detonators are dangerous after one half of the dissolving time elapses Personnel should be withdrawn from the danger area at least half of the arming time since a nearby concussion from enemy bombs or mines



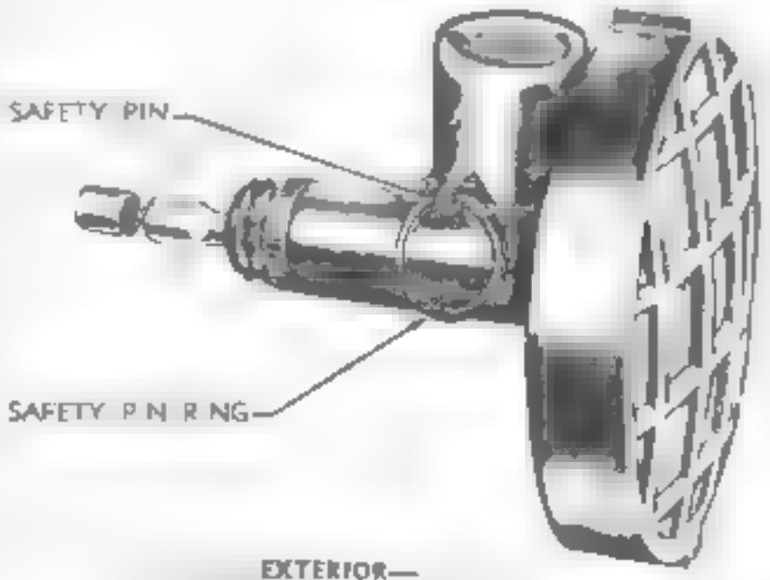


Figure 19. Detonator, concussion, M1

could fire the device. The initiating charge is not fired until the complete arming time of the delay tablet has elapsed.

(3) *Cardboard protective cover.* A cardboard protective cover fits over the salt tablet well, to prevent the tablet from dissolving during underwater installation. The cover should not be removed until the last possible moment before pulling the safety pin.

(4) *Ranges and depth.* Detonators frequently function at ranges greater than those given in table IV, but their reliability at those ranges is not assured. The device should not be used in surf at a greater depth than 15 feet. The snap diaphragm functions by hydrostatic pressure at a depth of 25 feet.

Table IV. Operating range of concussion detonators.

Initiating charge (lb)	In water		In air
	Depth of water (ft)	Recommended range (ft)	Recommended range (ft)
0.5	2	10	
0.5	4	50	
0.5	6	80	
0.5	8	80	
2.5			15
2.5	2	20	
2.5	4	80	
2.5	6	80	
2.5	8	150	
5			20
10			35
15			35
20			35
20	2	20	
20	4	80	
20	6	180	
20	8	260	

(5) *Installing device in water.*

(*a*) If long delay is necessary, remove blue tablet and install yellow tablet, taking care that spacer, safety pin, and cardboard protective cap are properly installed.

(*b*) Discard shipping plug from nipple of coupling base and carefully insert coupling base and blasting cap assembly with its associated gasket to form a tight waterproof fit.

(*c*) Screw the coupling base with blasting cap into threaded cap well of charge or connect blasting cap to charge with a short length of detonating cord.

(*d*) Wire or tie detonator to charge and make sure detonator diaphragm is free of obstructions and is clearly exposed.

(*e*) Place all charges in water where required.

(*f*) Remove cardboard protective covers from salt tablet wells.

(*g*) Remove safety pins.

(*h*) Evacuate danger area within one-half of the arming time of the delay tablets in use.

(*i*) Wait full interval of arming time of the delay tablet before firing initiating charge.

c. Preparation for Firing in Air.

(1) *Checking and preparing.* When the detonator is used in air, remove and discard the salt delay tablet. Before fitting the coupling base and blasting cap assembly to the detonator, check to make sure that the catch spring restrains the firing pin when the safety pin is withdrawn and that the spacer releases. When the safety pin is withdrawn, the firing pin should move forward approximately one-sixteenth of an inch, but it should not fall or fly out of the barrel of the detonator. If it falls or flies out of the barrel, discard the detonator. Replace the spacer and safety pin.

(2) *Range.* All charges equipped with concussion detonators should be placed reasonably equidistant and at least 15 feet from the initiating charge. When placed too close to another charge in air, the concussion wave frequently causes the diaphram to be impaled on the firing pin, resulting in a misfire.

(3) *Installing.*

(*a*) Remove shipping plug and carefully screw the coupling base and blasting cap assembly with its associated gasket firmly into the detonator.

(*b*) Screw the other end of the coupling base into the threaded cap well of the charge so that the blasting cap goes into the well, or connect the blasting cap to the charge with a short length of detonating cord.

(*c*) Wire or tie the detonator to charge, making sure that the detonator diaphragm is free of obstructions and is clearly exposed.

(*d*) Place all charges with detonator diaphragms facing initiating charge.

(*e*) Withdraw safety pins and evacuate area. *The detonators are immediately armed as soon as the safety pins are withdrawn.*

(*f*) Fire initiating charge when personnel are clear of danger zone.

d Disarming

(1) Depress spacer and force safety ball against shoulder of firing pin.

(2) Insert temporary nail through holes in salt barrel.

(3) Remove coupling base and resisting cap assembly from lever.

(4) Restore to original condition and repack.

Section III LIGHTERS

43 Lighter, Fuse, Friction Type, M1

This fuse lighter (fig. 20) is a lever for igniting safety fuse or time blasting fuse. It consists of a paper tube containing friction powder, which is mechanically ignited. The open end, when placed over the end of safety fuse or time blasting fuse, ignites the barbed surface inside the fuse lighter. The barbs are so designed that they permit the fuse to enter but prevent its removal except by force. A

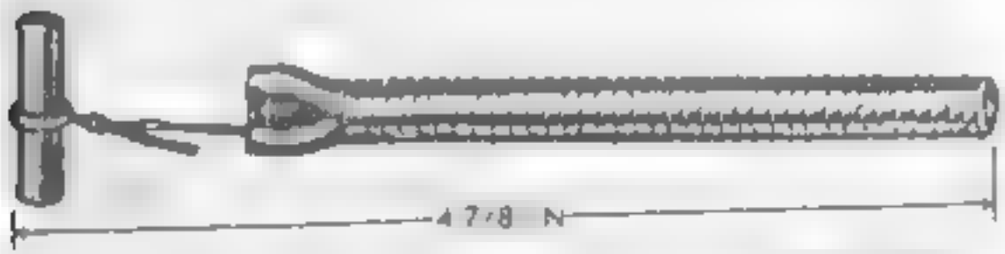


Figure 20. Lighter, fuse, friction type, M1.

pull on the loop will cause the steel wire to pull the powder train between the lighter and the end of safety fuse or time blasting fuse. The lighter is then pulled off the fuse by force immediately after pulling the igniter wire.

44. Lighter, Fuse, Weatherproof, M2

The weatherproof fuse lighter M2 (fig. 21) consists of a barrel that holds the firing mechanism and a base that contains a percussion cap and has a pronged fuse retainer. The barrel contains the striker spring and striker, which is held in the end by a release pin. The striker end is threaded to fit over the base. Plastic sealing material is used to waterproof the joint of the safety fuse or time blasting fuse and fuse lighter. When the release pin is pulled, the striker forces the percussion cap that, in turn, ignites the fuse. The lighter will ignite the fuse under all weather conditions, even under water.

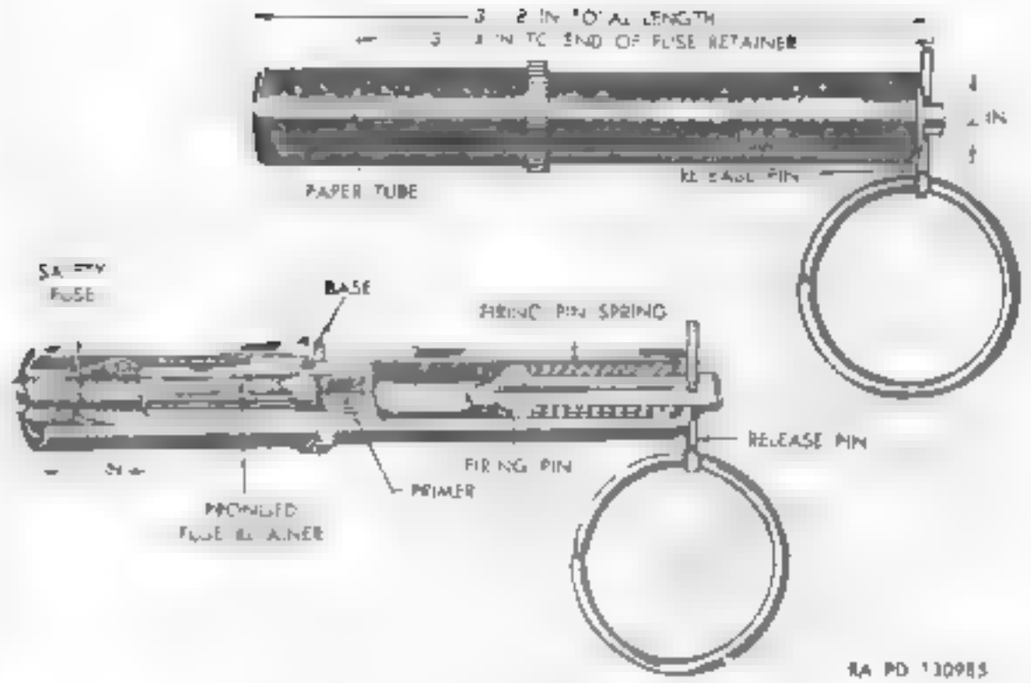


Figure 21. Lighter, fuse, weatherproof, M2.

Section IV SAFETY FUSE AND TIME BLASTING FUSE

45 Fuse, Safety, M700

a Description. This safety fuse is for general use in military blasting. It consists of a black powder core enclosed in several layers of jute yarn and tape coated with a moisture-resistant compound. It is dark gray and has a red stripe. It burns at a rate of 40 seconds per foot, with a tolerance of plus or minus 10 seconds per foot. Fuse lengths that correspond to approximately 1 minute each of burning time, within the above tolerance, are marked at 3-foot intervals. The fuse transmits a flame to a nonelectric blasting cap, which may be installed in a high-explosive charge that is dry or under water. The fuse, which has a black powder core, burns at approximately a uniform rate of 40 seconds per foot, allowing the person firing a charge to walk to a place of safety before the charge explodes.

b Preparation for use. In preparing to attach a nonelectric blasting cap, first cut off about 2 to 3 inches of fuse and discard. Cut the fuse squarely in the place provided in the jaws of the blasting cap crimper (pair 5). Insert the end of the fuse to be inserted truly to the bottom of the recess in the cap crimper. Then crimp the cap at the place provided in the jaws of the crimper.

c Precautions in Use and Handling. The fuse should be stored in a cool, dry place free from oil, paints, gasoline, kerosene, and similar distillates and solvents. In handling the fuse, avoid twists, kinks, or sharp bends that may rupture the covering or cause breaks in the powder train of the fuse.

46. Fuse, Blasting, Time

(fig. 22)

The fuse is limited standard for use in general demolitions. It is in the form of a cord approximately 0.20 inch in diameter and has a black powder core covered with several layers of fabric and water proofing material. It may be identified by its corrugated surface. Since the burning rate of different rolls of this fuse may vary between 30 and 45 seconds per foot, each roll of fuse should be tested before use by timing the burning of a 3-foot length. For preparation of fuse and precautions in storage and handling, see paragraph 44b and c.

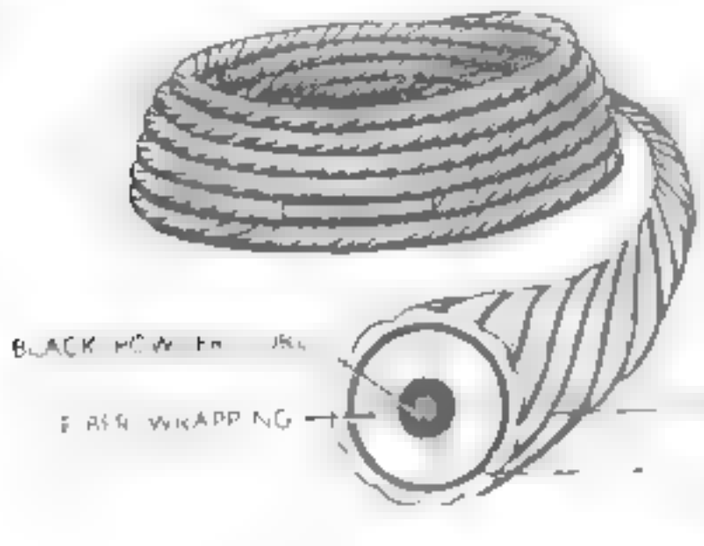


Figure 22. Fuse, blasting, time.

Section V. DETONATING CORD

47. Cord, Detonating, Waterproof

This cord consists of an explosive core of PETN contained in a braided seamless cotton tube. On the outside of this tube is a layer of asphalt on which is a layer of rayon. It is covered by a continuous extruded coating of plastic, which is colorless and smooth to the touch. The outside diameter of the cord is .200 inch. It is waterproof. Detonating cord is the standard cord for general use in all climatic conditions, both on land and underwater.

48. Cord, Detonating (PETN) (Fuse, Primacord)

a. Description. Detonating cord (standard stocks 43 and 44) consists of a flexible tube filled with PETN in the approximate amount of 40 grains per foot (approx. 5.7 lb per 1,000 ft). This cord is a limited standard item and will be used for training purposes only as soon as sufficient supply of waterproof detonating cord par 47 becomes available. It is ordinarily used to transmit a detonation

Figure 23. Cord, detonating, PETN (fuse, primacord).

from the detonating cap or from a lesser detonator to a charge of high explosive, or from one charge of high explosive to another with a time lag. (Time delay detonating M1 (par. 79) (fig. 25), is a small metal device used for joining detonating cord.)

b. Packing. The cord is packed in 1,000-foot spools. Several spools are packed in wooden boxes, some boxes containing 1,000 feet and some containing 4,000 feet.

49. Cord, Detonating, Reinforced, Pliofilm Wrapped

This cord is similar to that described in paragraph 48, except that it is covered with a waterproof plastic material. It is designed for use in severe weather

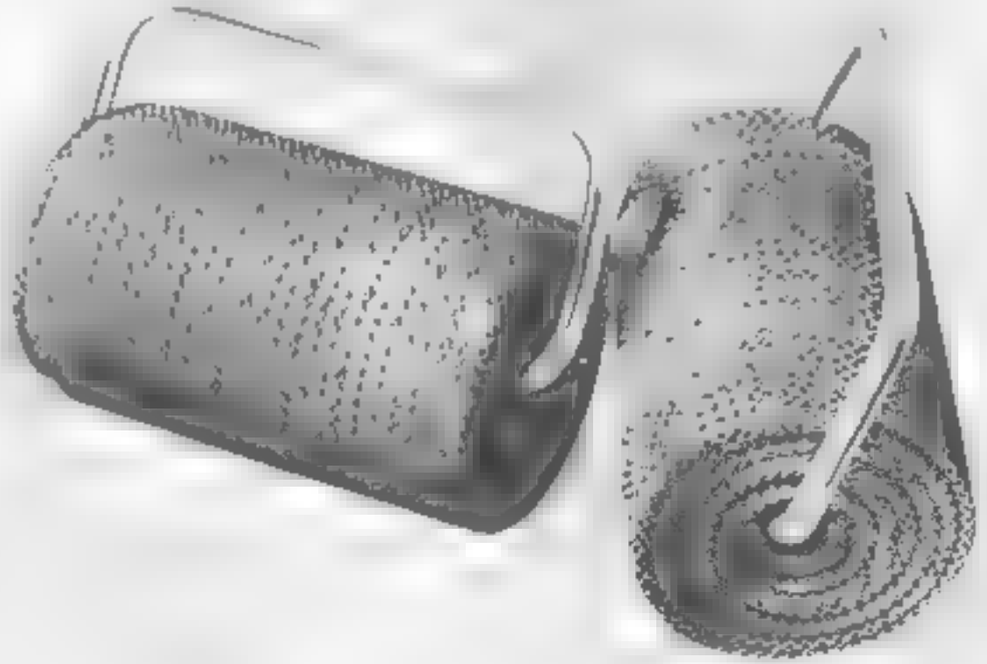
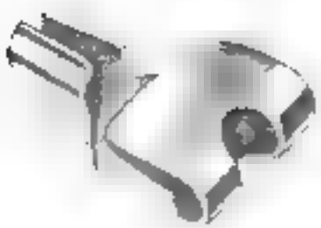
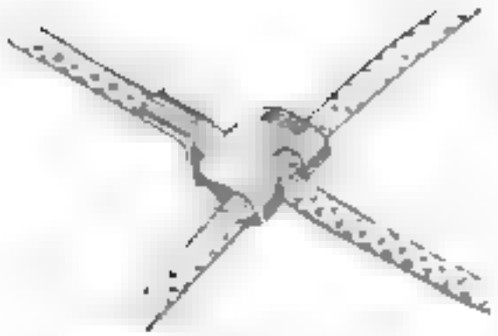


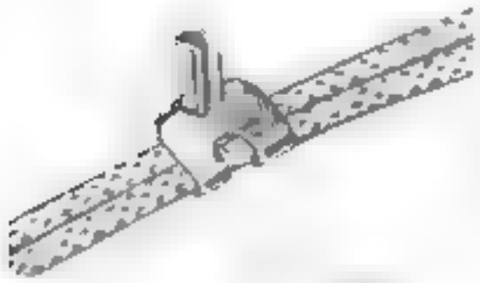
Figure 24. Cord, detonating, PETN (fuse, primacord) on spool with plastic handle.



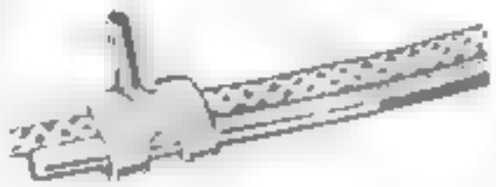
CLIP BEFORE BENDING



BRANCH LINE CONNECTION



SPLICING TWO CORDS



CONNECTING BLASTING CAP TO CORD

Figure 49. [illegible]

50. Cord, Detonating, 50-Foot Spool, Spliced

This is a [illegible] consists of [illegible]

Section VI. FIRING DEVICES

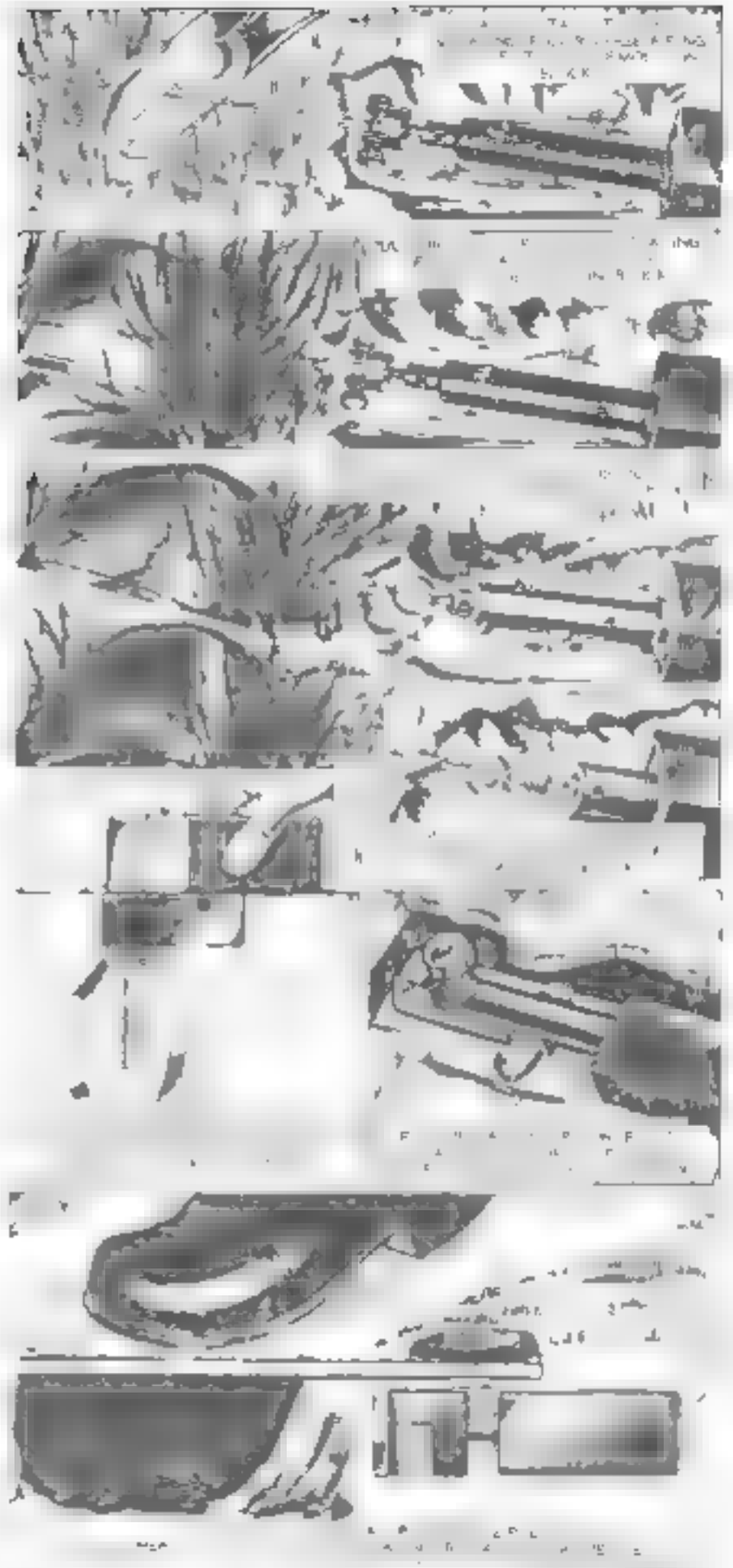
51. General

a. Firing devices [illegible] are of two general types: the [illegible] type and the box type. The [illegible] consisting of [illegible] arranged for [illegible] to the design of the particular [illegible]. The box type [illegible] consisting of a rectangular [illegible] arrangement for the [illegible] has a standard thread and nipple.

b. [illegible] is available, except in the [illegible] friction and [illegible]

As all firing devices [illegible] devices may be used [illegible] risk to be accepted.

c. Firing devices may be [illegible] charges [illegible]



RA PD 69426

Figure 50. [illegible]

if fitted to activators, with light antitank mines, and with improvised explosive charges. When a firing device is used with a service activator or a practice activator (TM 9–1940), a blasting cap or an igniter is not necessary and cannot be used. When used with light antitank service mines or with demolition blocks, a firing device requires a crimped-on blasting cap.

e. Primed coupling bases (pc mk 82–0–175A) are now issued separately for reuse of firing devices.

52. Firing Device Data

Dimensions and means of initiation of the various types, models, and delays of firing devices are shown in table V. It should be noted that a "tri-pronged firing mechanism," which supersedes the former pressure-cap-type combination firing device M1, is a component of antipersonnel mine fuzes M6A1 and M7A1 and antipersonnel mine fuze M10A1, see TM 9–1940.

Table V. Firing Device Data

Nomenclature	Means of initiation	Dimensions (in.)		
		Length	Width	Height
FIRING DEVICE, delay type, M1, black, 9-min delay. FIRING DEVICE, delay type, M1, red, 15-min delay. FIRING DEVICE, delay type, M1, white, 1-hr delay. FIRING DEVICE, delay type, M1, green, 2½-hr delay. FIRING DEVICE, delay type, M1, yellow, 5½-hr delay. FIRING DEVICE, delay type, M1, blue, 11½-hr delay.	Finger pinch	6¼	⅜ diam	⅜ diam
FIRING DEVICE, pressure-release type, M5.	Removal of restraining load.	1¾	1⅜₁₆	1¹¹⁄₁₆
FIRING DEVICE, pressure type, M1A1.	20-lb pressure	4¼	½ diam	½ diam
FIRING DEVICE, pull-friction type, M2.	3-lb pull	1½	⅜ diam	⅜ diam
FIRING DEVICE, pull-release type, M3.	Release or 6-lb pull.	4½	½ diam	½ diam
FIRING DEVICE, pull type, M1.	3-lb pull	4¾	⅜ diam	⅜ diam
FIRING DEVICE, release type, M1.	Removal of restraining load.	2	2	3

53. Firing Mechanism Tri-Pronged

a. This firing mechanism is a component of fuzes of bounding-type and cast-iron-block type antipersonnel mine fuzes. The firing mechanism consists of a head and case. The head contains a trigger pin, to which three pressure prongs are attached, and a release pin. The case contains a spring-loaded firing pin, which also extends through the head. The tri-pronged firing mechanism is used with antipersonnel mines (*b–d* below), see TM 9–1940.

b. When the long-type coupling base with black powder igniter is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M6A1, which is used to fuze antipersonnel mine M2A4 and parachute trip flare M48. The firing mechanism alone may be designated and identified as FUZE, mine, combination, M6A1, less igniter assembly.

c. When the short-type primed coupling base with special blasting cap Type I crimped thereto is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M7A1, which is used to fuze antipersonnel mine M3. The firing mechanism alone may also be designated and identified as FUZE, mine, combination, M7A1, less blasting cap assembly.

d. When the safety-fused-type primed coupling base with black powder igniter is fitted to the firing mechanism, the assembly becomes FUZE, mine, combination, M10A1, which is used with antipersonnel practice mine M8. The firing mechanism alone may also be designated and identified as FUZE, mine, combination, M10A1, less igniter assembly.

54. Firing Device, Delay Type, M1

a. General. This is a chemical device (fig. 27) used for delay action firing of a mine, demolition block, or other explosive charge.

b. Description. The device consists of a two-part case or tube, the parts being joined near the center by a coupling. The tube is about three-eighths of an inch in diameter and the device is 6¼ inches long including a primed coupling base, which is not removable, having the same size thread and nipple as on all firing devices. The half of the case attached to the coupling base is brass and the other half is thin copper capable of being crushed between thumb and finger. The copper half contains a sealed glass ampoule of corrosive chemical and the brass half houses a firing pin and spring. An identification and safety strip, colored according to the length of delay in which the device functions, extends through slots opposite an inspection hole near the primer of the coupling base. Devices with black, red, white, green, yellow, and blue strips are packed separately, according to color. A restraining wire, extending from the end of the device

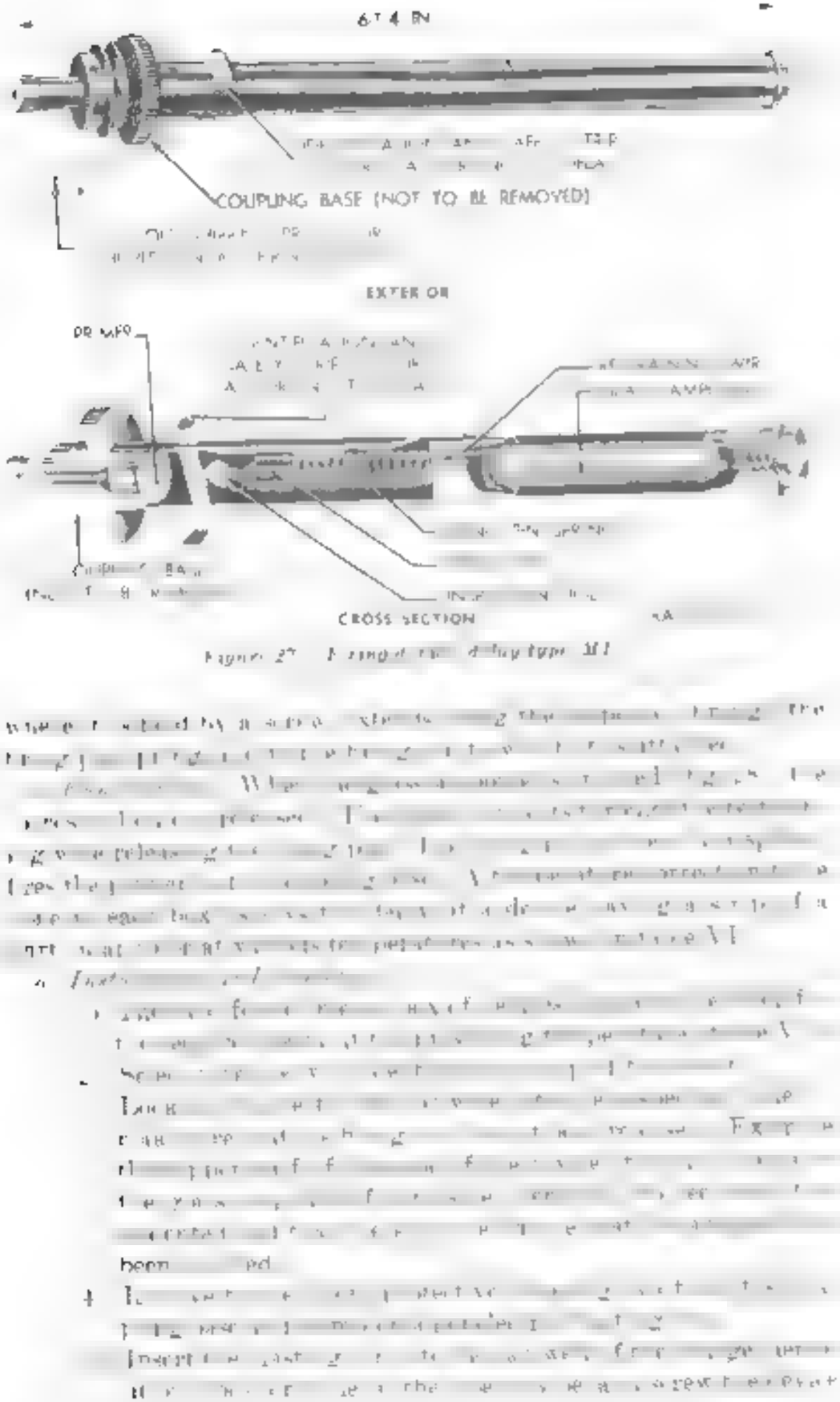


Figure 27. [illegible] delay type M1

[illegible]

into the threads of the well

[illegible] type M

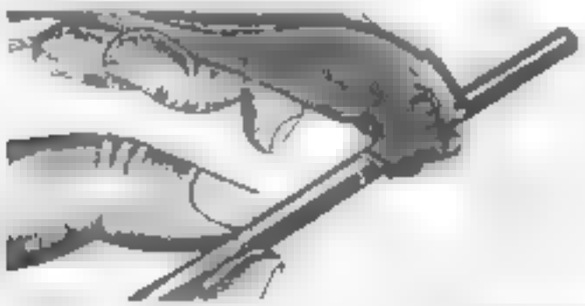
Class								
ONE								
26 day	1/2 day	8 hr	1 day	2 days				32
17 hr	8 hr	2 days	24 hr	5 days				17
6 hr	2 hr	14 hr	6 hr	1 day				10
2.5 hr	40 min	5 hr	2.5 hr	1 day				2
70 min	30 min	2 hr	45 min	52 hr				38
35 min	15 min	80 min	30 min	25 hr				52
20 min	8 min	40 min	21 min	30 hr				60

[illegible]

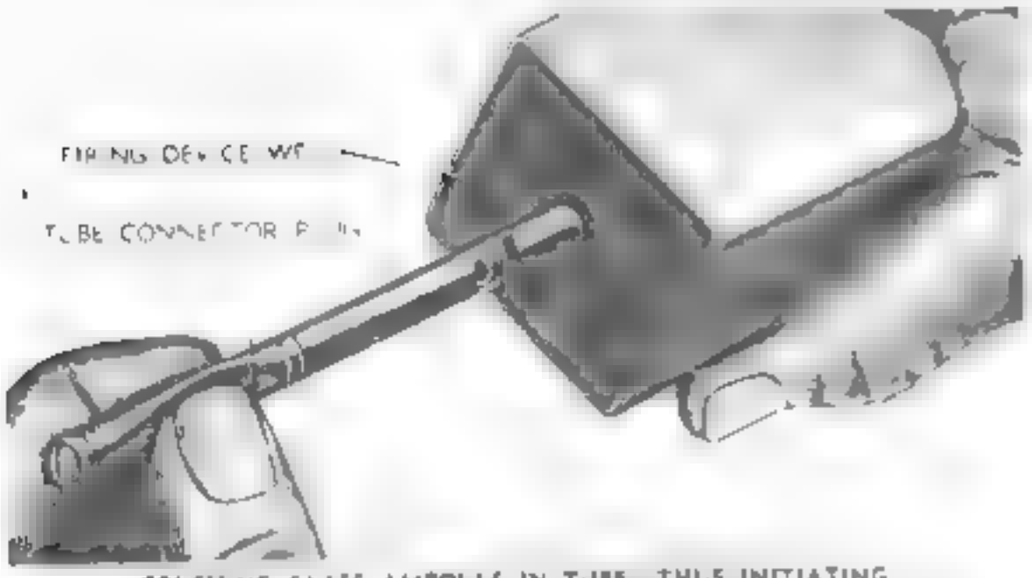
White								
[illegible]								
24		2.5 hr	1 hr	20 min	8 hr	1 day		13 day
25	3 min	16 min	2 hr	1 hr	5 hr	2 hr		65 min
12	1 min	7 min		30 min	2 hr	1 hr		27 min
75	1 min	4 min		15 min	1 hr	30 min		14 min
08	30 sec	2.0 min	30 sec	8 min	30 min	15 min		9 min
27	15 sec	1.5 min	15 sec	2 min	20 min	8 min		6 min
50	8 sec	1 min	8 sec	1 min	8 min	4 min		3 min

[illegible]

6. If detonating cord is used, tape one end of the cord to the blasting cap. Tape the cord to the charge, block, or mine, where the cord will be better protected against rough handling.
7. Crush a booby trap between two objects.
8. Look through the peephole to see whether the firing pin has been released.



CRIMPING BLASTING CAP TO COUPLING BASE



CRUSHING GLASS AMPOULE IN TUBE—THUS INITIATING THE DEVICE INSTALLED ON DEMOLITION BLOCK

DA PC 319 8

Figure 28. Firing device, delay type M1, installation.

c. If the firing pin rests on the cotter pin, remove the device with the safety strip in place.
d. If the firing pin has not been released, withdraw the safety strip.
e. *Neutralize.* There is no safe way to neutralize the delay device. If an extreme necessity arises to neutralize the device before the period of delay expires, a cotter pin or a wire should be inserted very gently through the inspection holes. The device should then be removed from the charge and disarmed because, once activated, it cannot be made safe.

f. *Precautions.*
(1) When screwing the device into an explosive item, it should be done with the hand and not by gripping the firing pin between the jaws of pliers or other tools.
(2) Inspect the inspection holes to see whether the cotter pin or wire has been removed. If not, carefully remove the device.
(3) Devices which have been fired without the type of device having been installed and tested should be especially marked and recorded. Improper functioning of installed charges employing this type of delay firing device.

g. *Packing.* The device is packaged in paperboard boxes, sets of 2 devices of the same lot number. Packages are packed in wooden packing box.

55. Firing Device, Pressure-Release Type, M5

a. *Description.* This device (fig. 29) consists of a rectangular pressure-release case containing a spring-loaded striker. The striker is restrained by a release plate, which is held in place by a safety pin. A coupling base fits into the threaded hole in the bottom of the case. This device is used to initiate antitank mines equipped with supplementary fuze wells and for certain booby trap installations with charges having a threaded well.

b. *Functioning.*
(1) When restraining load of at least 5 pounds is displaced more than two eighths of an inch, the release plate releases the firing pin.
(2) The firing pin is propelled by spring pressure onto cap.

c. *Installing and Removing.*
(1) Inspect the device to make sure that there are no obvious defects, that firing pin is seated and that the safety pin is in proper position.
(2) Remove small cotter pin.
(3) Insert small or larger diameter steel wire through interceptor holes.
(4) Remove the coupling base.
Remove the recessed crimping cap from the coupling base and crimp on a nonelectric cap.
(5) Screw the coupling base into the firing device.
(6) Screw the device into the threaded fuze well opening of charge or mine.
(7) Install so that the release plate is held closed by weight of a mine, a charge, or a booby trap bait, or by wedging against some stable object. If the device is in the ground, use a small board inserted with the device to provide solid foundation.

365238 O—55——5

See that the safety pin is in proper position and adjust the insulator so that the safety pin will slide easily.

(9) Remove the safety pin restraining device by pulling attached cord. If lines become tangled or restraining force is probably inadequate, inspect pin for check.

(10) If firing device is to be set up for more than immediate use, remove protector cap. Insert cotter pin.

d. Warning.

1. Insert wire through interrupter holes.
2. Insert safety pin.

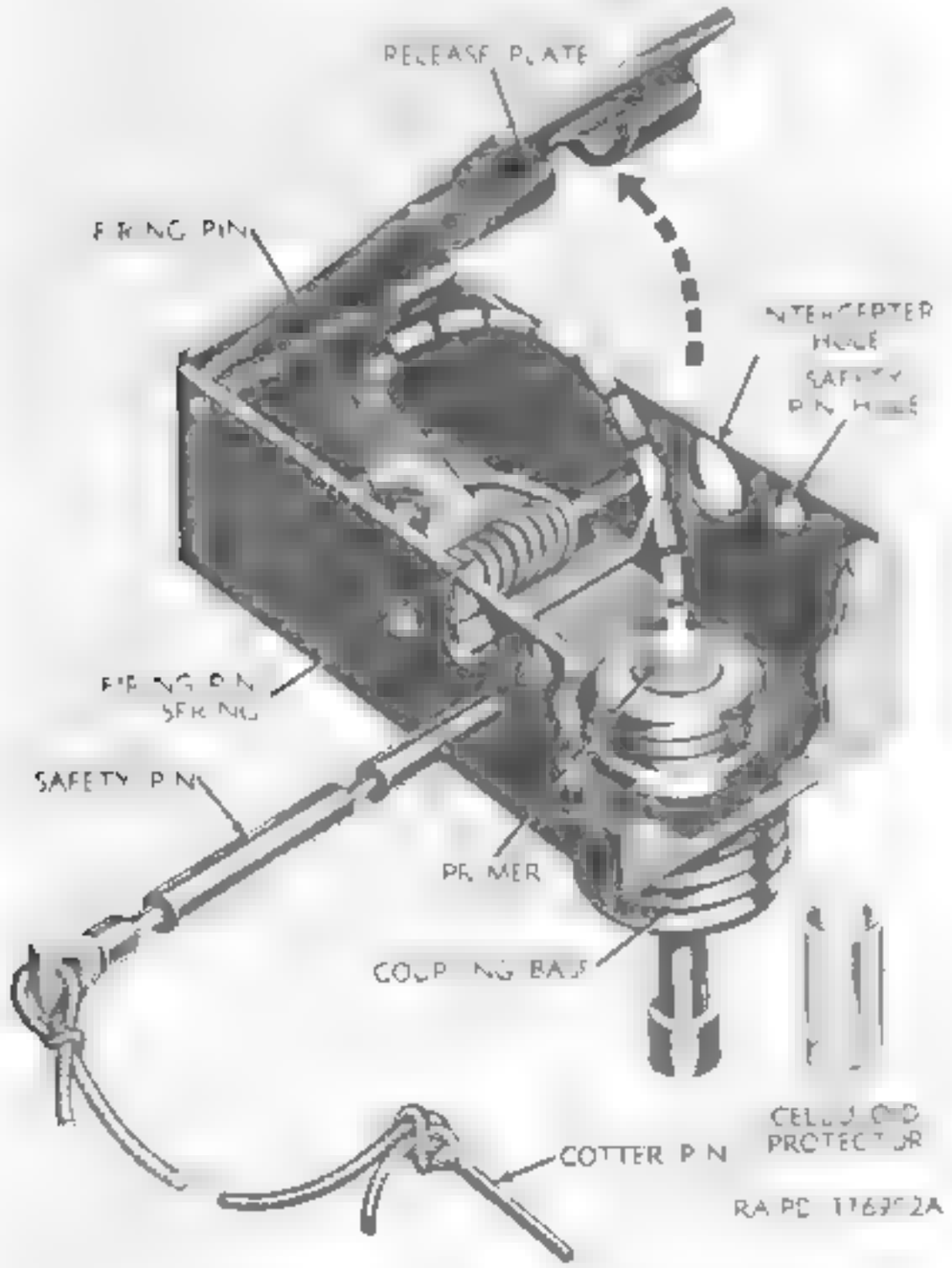


Figure 29. Firing device, pressure-release type, M5.

3. Remove wire or other restraining tool.
4. Remove the device from mine or charge.

Unscrew coupling base and discard or store in a safe place. Protector cap from used 15-second delay firing device may be used if unable to remove blasting cap from the coupling base.

e. Packing. For packing procedures, complete with packaged primers, the coupling base, and four spare primers, units are packed in a cardboard box. The dimensions (in.) of the box are 15/8 x 8 x 4¾, and the packing weight is 15 ounces.

f. Reuse. If the primer portion of the standard coupling base has been fired in training or if there is no blasting cap attached to the base, the base may be reused if desired by removing the fired primer and pressing an M54 or M54A1 primer firmly into place. To remove the fired primer, proceed as follows:

(1) Remove the coupling base.

2. Hold the coupling base with the release plate toward the ground.

With the base held in this position, apply pressure to the end of the firing mechanism, force the firing pin back to cocked position.

3. Hold the coupling base with the release plate toward the ground.
4. Insert safety pin.
5. Work the release plate back and forth with a screwdriver to see that it is operating freely and then replace safety pin.

Note. Use the tools and procedures described in paragraph

56. Firing Device, Pressure Type, M1A1

a. Description. This firing device is designed for use as a pressure-release firing device in booby traps. It consists of the firing mechanism, case, and coupling base. The case contains the firing mechanism and three legs each with a hole for use in staking the device. The coupling base is provided with a groove in the top, and the bottom has a pressure cap. The coupling base is provided with a spool pin. The smaller part of this opening fits into a groove in the firing pin, and the larger part of the opening permits the free movement of the firing pin. The release mechanism is an integral part of the case and the firing pin. The pressure cap is provided for use of an extension. The coupling base, which [illegible] prevents the firing pin from moving. The safety pin passes through the case between the firing pin and the primer. When the coupling base is screwed

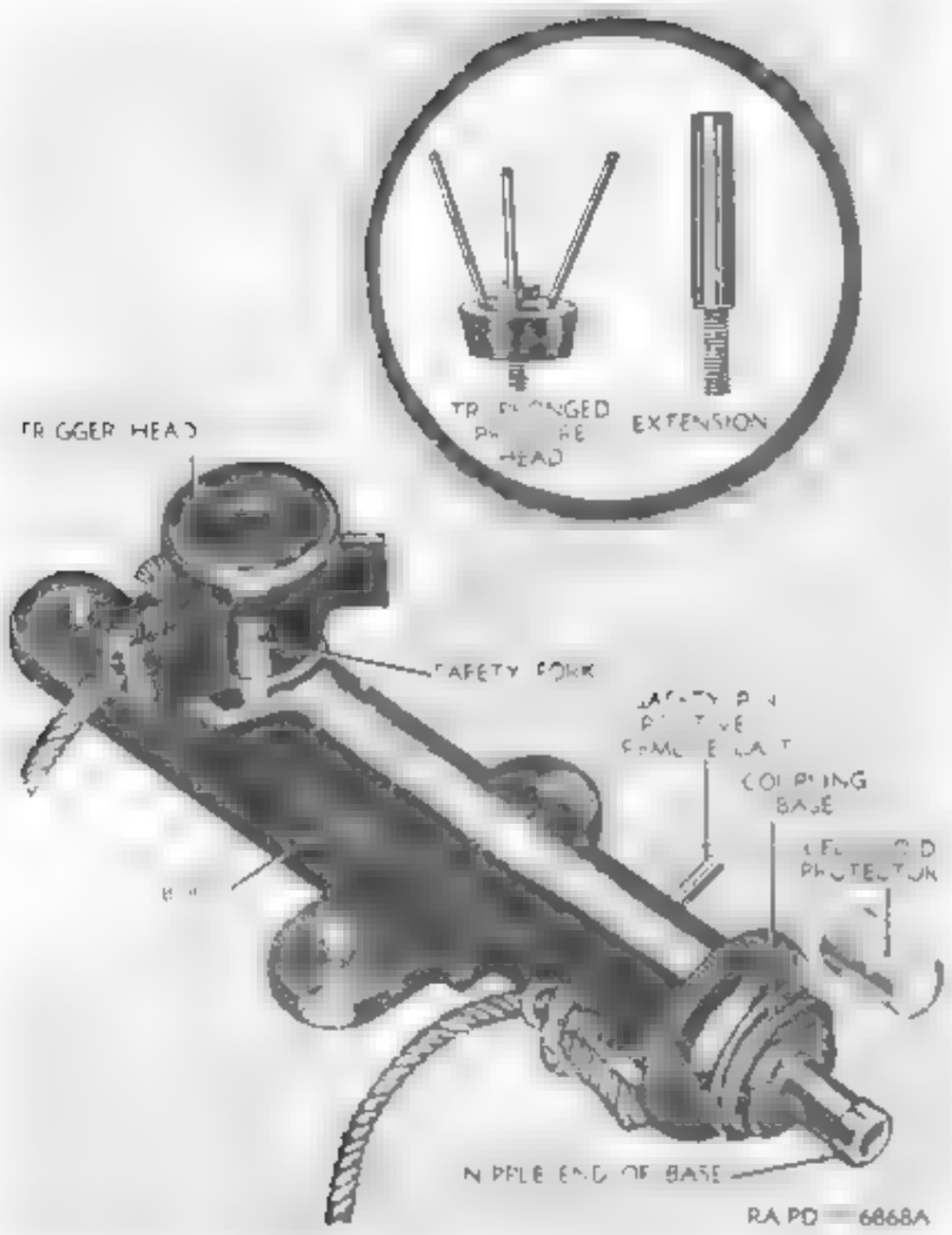


Figure 30. Firing device, pressure type, M14.

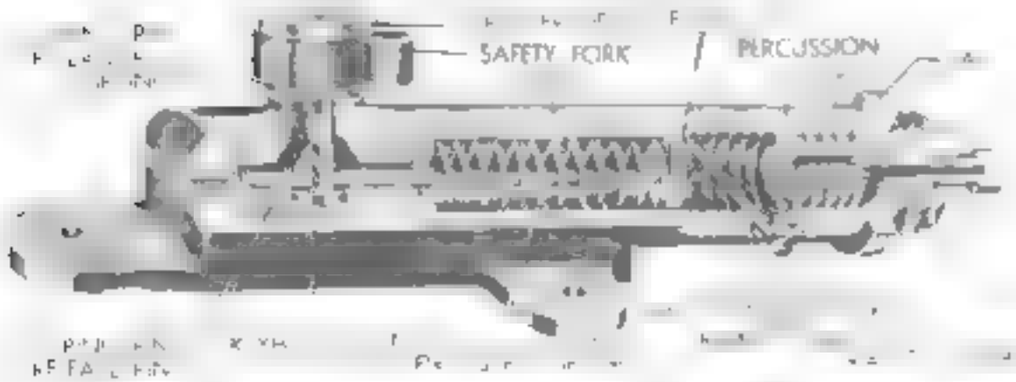


Figure 31. Firing device, pressure type, M14, sectioned.

pin from striking the primer. Could the firing pin be accidentally released?

c. Functioning. A pressure of 20 pounds on the pressure cap compresses the firing pin release plunger spring and pushes the release pin forward. When the enlarged portion of the key-shaped opening in the release pin comes in line with the spindle, the firing pin is released. The spring-loaded firing pin then fires the primer.

d. Preventive maintenance.

(1) *Inspection of firing mechanism.* Check the firing mechanism as directed in (a) through (f) below.

(a) Unscrew coupling base from the firing mechanism and inspect the primer. Insert the coupling base and hold it against the firing mechanism with the nipple extending into the recessed end of the firing mechanism.

(b) Hold the coupling base firmly against the case, remove safety fork and safety pin, depress the pressure cap. The firing pin should strike the upper end of the coupling base with sufficient force to indent the primer.

(c) Inspect the firing pin for [illegible] with unsharpened end of a pencil or a small blunt rod and, at the same time, pressing downward on the pressure cap, [illegible] firing pin release plunger.

(d) Depress pressure cap and allow it to return to position. The groove in the firing pin should engage the groove in the release plunger. Replace safety pin and safety fork. The safety pin should be free to engage the safety fork slot or free to disengage for easy removal after the firing mechanism is assembled.

(e) Screw the coupling base into the firing mechanism and tighten [illegible].

(f) [illegible]

(2) *Lubrication.* Remove the safety fork and safety pin from the firing mechanism. Lubricate the firing mechanism, safety fork, and safety pin as directed in paragraph 4 above. Replace safety fork and safety pin.

(3) Place the firing mechanism on a firm flat foundation.

(4) Place a [illegible] on the pressure cap. If the firing mechanism does not contain a pressure cap screw, [illegible] against the pressure cap and adjust by screwing the set screw in or out. Turning the set screw one quarter turn to release any pressure on the pressure cap. If the proper [illegible] is to be used, screw it into the pressure cap and adjust in the same manner.

d. Remove the safety fork. It should pull off easily. A sudden jerk may cause firing device to function. If the safety fork does not pull off easily, check the installation to make sure there is no pressure on pressure cap.

e. Using the attached cord, pull out safety pin slowly and carefully. If it resists [illegible] the firing pin may have been released and [illegible] pressing against it. [illegible] In this case replace the safety fork, [illegible] and remove firing device from mine. Unscrew coupling base and check firing mechanism. If the firing mechanism is defective, replace it.

Note. Remove the safety pin [illegible] using a length of wire [illegible].

f. Retain safety fork and safety pin for use [illegible] arming.

[illegible]

a. Carefully insert the safety pin into the case of the firing device [illegible] safety fork.

b. Take [illegible] firing device [illegible] explosive charge.

[illegible] firing device from mine or explosive charge [illegible].

Restore firing mechanism [illegible] coupling base to original [illegible] packing.

Packing. [illegible] devices are packed [illegible] cartons [illegible] per wooden box. Approximate dimensions of packing box are 27¼ x 12¾ x 10¼; the weight of the complete packing is [illegible] pounds.

57 Firing Device, Pull-Friction Type, M2

a. General. This firing device (fig. 32), which contains a friction igniter, [illegible] is actuated by a pull [illegible] for use in setting up booby traps.

b. Description. The firing device consists of a body, a nonremovable base [illegible] a pull ring, a spring, [illegible] coated wire secured by a safety pin. The nipple on the base [illegible] base is fitted with a celluloid protector, which contains a dessicant to keep the friction compound dry. The [illegible] end of the base [illegible] [illegible] firing device [illegible]. The coated wire, to which the spring and pull ring [illegible] attached, passes through [illegible] the friction compound [illegible] the [illegible].

c. Functioning. A direct pull of 3 to 9 pounds on the trip wire [illegible] stretches the spring and draws the coated wire through the friction compound, thereby igniting it.

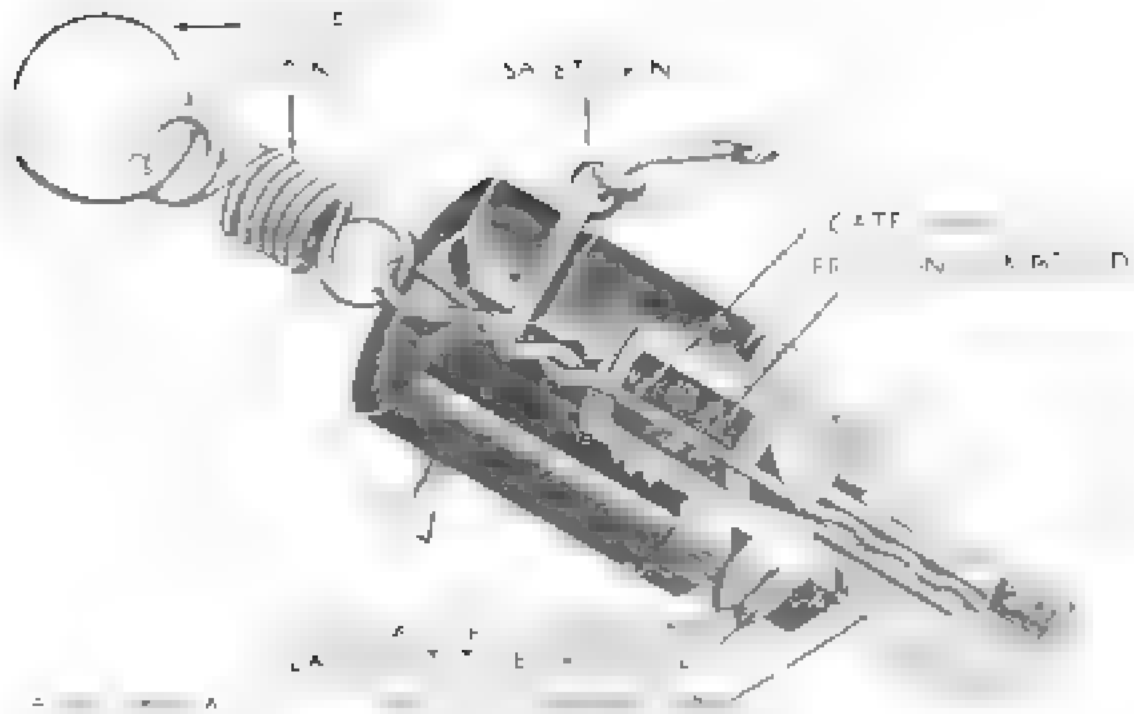


Figure 32. Firing device, pull friction type M2, sectioned.

d. [illegible]

(1) [illegible]

[illegible] Check [illegible] that the safety pin [illegible]

[illegible] If [illegible] moisture, a dud may result.

(2) *Installation and arming.*

(a) Remove [illegible] from the [illegible] coupling base.

(b) [illegible] the firing device [illegible] M1 [illegible] M1 [illegible]

[illegible]

arrange the installation to obtain adequate concealment.

(d) Attach free end of trip wire to pull ring, drawing up excess wire through pull ring.

(e) Using the attached cord, pull out the safety pin slowly and carefully. If undue force is required to remove the pin, examine spring to make sure it is not tensioned and examine safety pin for excessive spread of legs. If defective, replace firing device.

Note. Remove safety pin from a safe distance, using a cord or length of wire for the purpose.

(f) Retain safety pin for future use in disarming the firing device.

(3) *Disarming and removal.*

(a) Carefully insert safety pin into body of safety device, making sure that the legs of safety pin are closed. After safety pin is in place, spread the legs slightly to prevent accidental withdrawal of pin during handling and shipment.

(b) Disconnect trip wire from the pull ring.

(c) Unscrew firing device from mine or charge, and destroy the booby trap in safe place.

Caution: Do not attempt to remove the blasting cap from the firing device.

(4) *Issue.* An assembled pull-release firing device may be restored to operating condition by replacing parts. Unassembled firing devices may be issued for repair.

c. Packing. Five boxes with two 5-foot spools of trip wire are packed in each exterior shipping container, packages 5 to 10 devices per wooden box.

58 Firing Device, Pull-Release Type, M3

a. General. This firing device (fig. 53) is a mechanical device containing a percussion cap. It is designed for actuation by either an increase (pull) or decrease (release) of the tension in a taut trip wire and is intended for use without personnel mines M3 to assemble booby traps.

b. Description.

(1) The firing device consists of a head, body, coupling base, firing pin, release pin, safety pin, and winch assembly. The head, which is screwed to the body, acts as a guide for the release pin. The body contains a spring-loaded firing pin, which rests against the end of the release pin when the latter is installed. The coupling base, which screws into the body, retains the primer. The outer end of the coupling base is threaded to fit actuators and firing device wells (cap wells) and has a nipple, to which an adapting cap may be assembled.

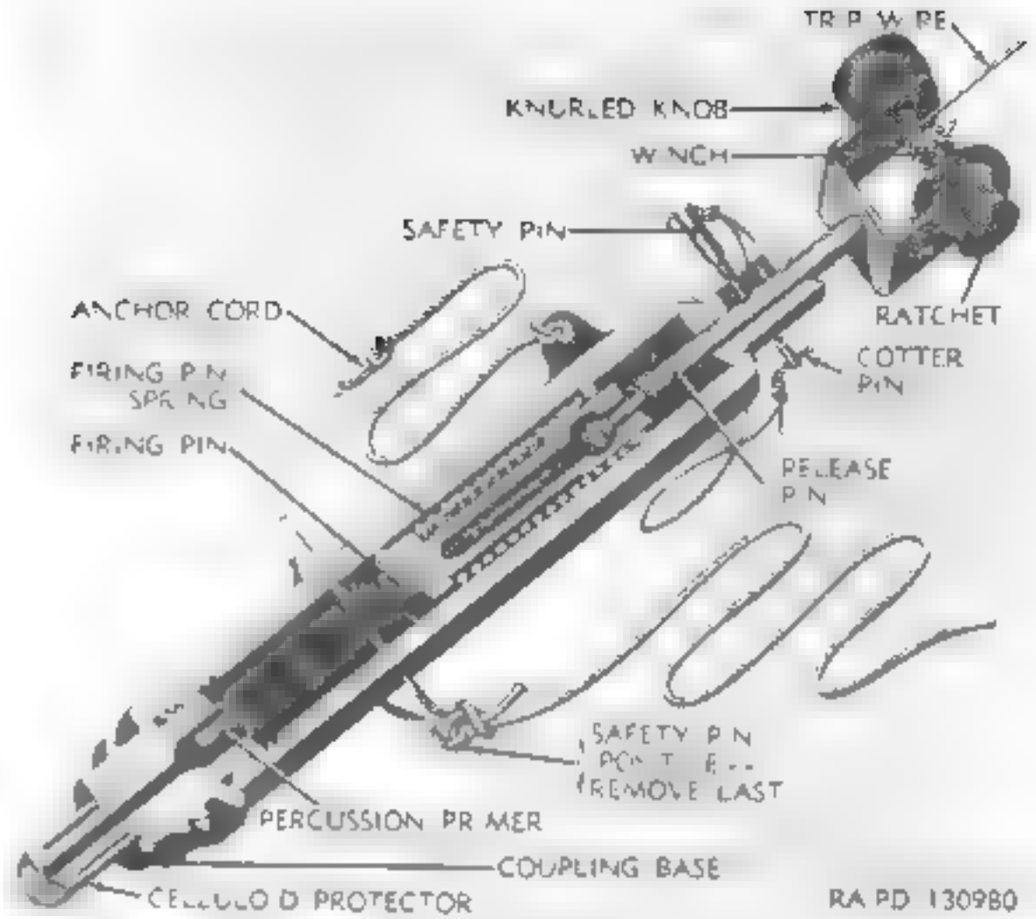


Figure 53. Firing device, pull-release type, M3—assembled.

(2) The outer end of the firing pin is slotted longitudinally to form four jaws and grooved internally to receive a notch on the inner end of the release pin. The slotted end of the firing pin passes through a circular opening in the body in which position it is held by the knob of the release pin when the release pin is in its normal axial position and the safety pin in place. The safety pin passes through an elongated opening in the head and a hole in the release pin. A small cotter pin, which passes through a hole in the end of the safety pin, prevents accidental movement of the safety pin arrangement. The safety pin, when in position, prevents forward or rearward movement of the release pin beyond the slight movement permitted by the elongated slot in the head. This prevents release of the firing pin. The winch, consisting essentially of a bracket, spool with a knurled knob, and a pawl, is attached to the outer end of the release pin.

(3) A positive safety pin, one leg of which passes through a hole in the body between the firing pin and the primer, prevents the firing pin from striking the primer should the firing

pin be accidentally released. The other leg of the safety pin is bent around the body to keep it from rotating when priming and handling. An anchor cord (1 in. long) attached to the eyelet on the body is used to anchor the firing device firmly during installation.

c. *Function.*

(1) *Pull-release.* A direct pull of 8 to 10 pounds on the trip wire releases the release pin and bends it to the side, outward and the jaw end of the firing pin passes beyond the constricted opening in the body. It then pivots on the jaw spreads it, releasing the firing pin from the notch of the release pin. The pull-release firing device is activated by a pull on the trip wire.

(2) *Tension-release operation.* Release of tension on the trip wire or the firing device releases the release pin and spring housing, moving it outward. When the end of the firing pin clears the constricted opening in the body, it pivots, spreads the jaws, freeing the firing pin from the release pin. The released firing pin is then driven by the spring into the primer.

d. *Operational procedure.*

(1) *Inspection before use.* Check the device as specified in the general directions.

(2) Unscrew the safety pin and safety pin retainer from the firing device.

Inspect the safety pin and the safety pin retainer to see that they are free enough for ease removal after the device has been installed.

(3) Leaving the safety pin and safety pin retainer in place, twist the wire assembly out with the forefinger and thumb. Grasp the safety pin and release, repeat two or three times. The wire assembly should move smoothly and approximately one-quarter inch and should require a force of 10 to 20 pounds. If the assembly binds or releases with too much pressure, the firing device is faulty and cannot be corrected, use another firing device.

(4) *Installation and arming.*

Remove the protective cap from the base of the primed firing assembly and discard the cap.

Screw the firing device into the primed firing device (fig 34).

Screw the firing device, with the safety pin and safety pin retainer in place, into the charge or other explosive charge.

e. Secure the trip wire at the anchor end making sure that there is slack in the trip wire to prevent premature discharge. Before connecting the trip wire to the firing device,

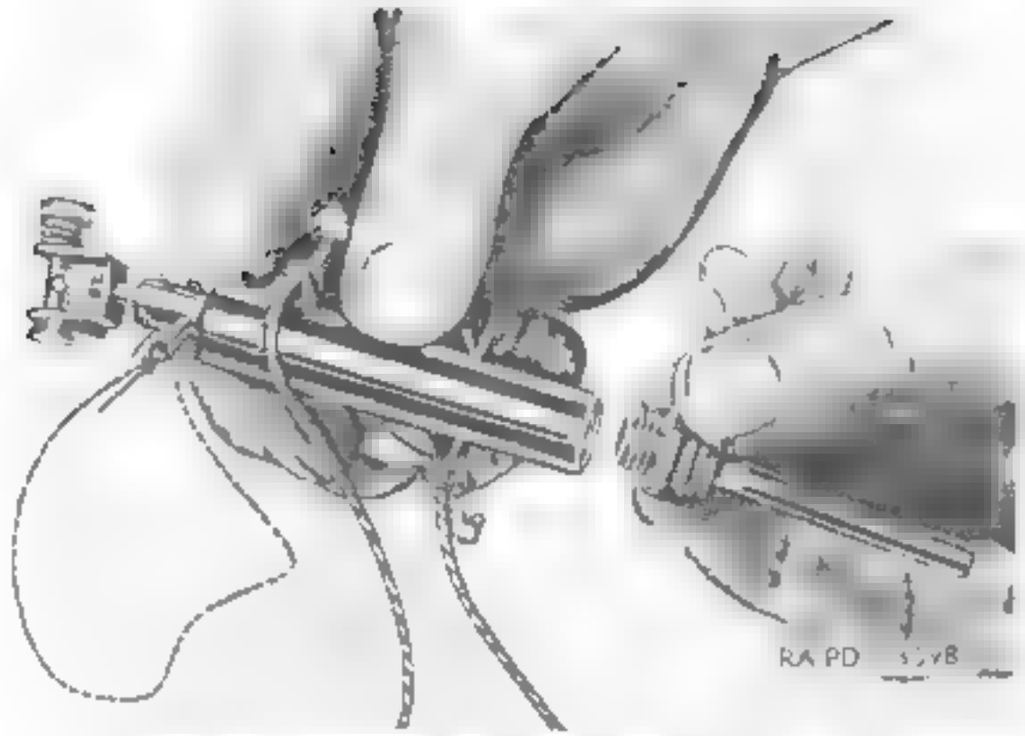


Figure 34. Assembling pull-release type firing mechanism to primed exploding bolt with crimped-on safety cap.

step 1 the safety pin is inspected for retention by the safety pin retainer. If necessary, repeat the instructions in step 1 until the safety pin is properly retained.

(2) Remove the safety pin and safety pin retainer from the wire assembly by pulling out the safety pin. Insert the safety pin through the hole in the wire assembly and the safety pin retainer. Twist the wire assembly out with the forefinger and thumb. Grasp the safety pin and release, repeat two or three times. The wire assembly should move smoothly and approximately one-quarter inch and should require a force of 10 to 20 pounds. If the assembly binds or releases with too much pressure, the firing device is faulty and cannot be corrected, use another firing device.

(3) Remove the safety pin from the safety pin retainer and remove the safety pin. If safety pin does not come out easily, repeat step 2 until the safety pin is loose enough to be withdrawn easily.

(4) Using the attached cord, pull out the safety pin slowly and carefully. If it does not come out easily, repeat step 2 until the safety pin and retainer are free. If it still does not come out easily, remove the wire assembly by pressing the body and pulling it out. If the wire assembly comes out easily, repeat step 2. If the wire assembly comes out easily, repeat step 2. If the wire assembly comes out easily, repeat step 2. If defective, replace the entire firing device.

f. When finally removing safety devices, remove them from a safe distance using a long pull cord tied for the purpose.

g. Remove safety devices for subsequent use in disarming

(3) *Disarming and removal.*

(a) Carefully insert the safety pin into the body. The pin should enter freely.

(b) Insert the safety pin and install cotter pin.

(c) Release tension on trip wire by depressing knurled knob and stripping off wire.

(d) Remove firing device with blasting cap attached from the explosive charge or mine.

(e) Unscrew the primed coupling base from the firing mechanism. *Do not attempt to remove the blasting cap from the primed coupling base;* either destroy it or store it in a safe position.

(f) Restore firing mechanism to original condition and packing.

c. *Packing.* Five devices with two reels of trip wire are packed in a carton, 5 cartons per inner package, 6 packages to a wooden box. Approximate dimensions of the box are 13½ x 6½ x 4½ inches. The weight of the complete packaged unit is

59 Firing Device, Pull Type, M1

a. Scope. This firing device is one of the firing pin type. It is designed for actuation by a trip wire and is intended for use with antipersonnel mine M3 and improvised antipersonnel mines, for actuation of future mines, and for setting off booby traps.

b. Description.

(1) This firing device consists of a cylindrical case (body), head and coupling base. The head, which is permanently joined to the case, contains a release pin, release pin ring, a loading spring, and a safety pin. The case, which contains the firing mechanism, consisting of the firing pin and compression spring, also contains a positive safety pin. The coupling base, which screws into the case, contains the primer. The outer end of the coupling base is threaded to fit actuators and firing device wells (cap wells). It has a nipple to which a blasting cap may be assembled.

The pin ring end of the firing pin, which is slotted axially to form four jaws, passes through a cylindrical opening in the case. The end of the release pin fitting into an axial hole in the slotted end of the firing pin, causes it to engage on the upper surface of the opening, thereby restraining downward movement of the firing pin.

(2) The safety pin, which passes through a hole in the head and a hole in the release pin, prevents accidental movement of the release pin during shipment and handling. The positive

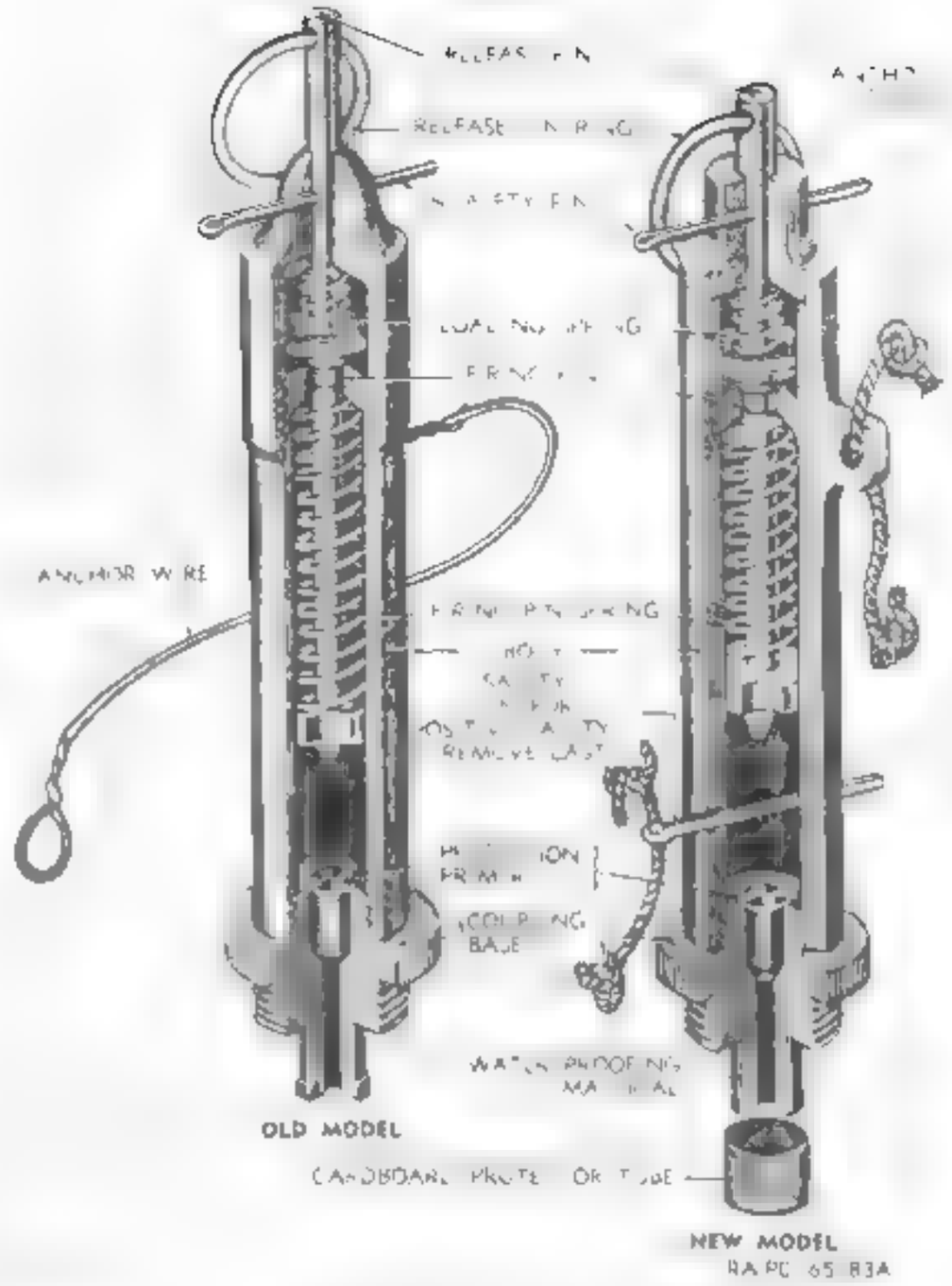


Figure 6. Firing device, pull type, M1, sectioned.

safety pin, which passes through a hole in the case between firing pin and primer, prevents the firing pin from striking the primer should the firing pin be accidentally released. An anchor cord on the case is used to anchor the firing device firmly during installation.

c. Functioning. A direct pull of 3 to 5 pounds on the trip wire causes the release pin to be pulled outward, overcoming the resistance of the loaded release pin spring. The slotted end of the firing pin,

being no longer restrained by the safety device, permitting the firing pin to be released from the firing pin spring to fire the primer cartridge.

d Instructions for Use.

(1) *Inspection before firing.* Clean the firing device and inspect it thoroughly as follows:

a Unscrew the primer adapter case and inspect primer. Invert adapter case and shake out any foreign matter inside the case.

b Hold adapter case upside down against the case, remove the positive safety pin and the head safety pin. Pull outward on the pull ring. Examine the end of the firing pin for burrs, which may prevent free movement of the firing pin. Remove burrs by honing with a fine stone. Wipe with a dry cloth to remove all oil and dirt from the firing pin and safety pin holes. Apply a thin film of light machine oil to the firing pin and safety pin holes.

c Insert positive safety pin and head safety pin into the primer adapter case to their full depth, primer end first. Pull outward. Safety pins should be free enough for easy removal if not the firing device is defective and should be replaced.

(2) *Installation in projectile.*

a Remove the primer adapter case.

b Remove the protective cap from the firing device and screw the primer adapter case into the firing device.

c Screw the firing device with safety pins in place into the proper fuze cavity in the projectile.

d Install base trip wire, attaching it to the trip wire eyelet in the firing device before screwing the firing device into the projectile. Inspect for determination of trip wire length. If necessary, rearrange the installation to obtain adequate engagement.

e Attach free end of wire to trip, bringing wire through pull ring just far enough to remove all slack.

(*f*) Remove the head safety pin. If it does not pull out easily, the firing pin may be retracted. Adjust firing wire for correct length. If head safety pin still does not come out, remove the firing device and check mechanism. If defective, replace faulty firing device with a serviceable one.

If the head safety pin will not pull out, the positive safety pin is withdrawn carefully. If it results, the firing pin may have been retracted and is pressing against the spread of legs of the positive safety pin. If excessive. If spread of legs is not excessive but the pin still results gentle pull, install head safety pin, unscrew firing device and

check mechanism. If defective replace faulty firing device with a serviceable one.

e Remove the safety pin from the safety device and remove the primer adapter case.

Remove safety pin for future use and unscrew the firing device.

g Instructions for Use.

(1) Unscrew the primer adapter case and remove the safety pin from the firing device. After assembly, spread legs of safety pin to prevent accidental loss of pin during handling and shipment.

Inspect for burrs, wire for proper length.

Insert firing device with two safety pins in trip wire eyelet and primer adapter case.

Remove safety pins and attach wire.

(2) For [illegible] with two safety pins in trip wire eyelet and primer adapter case, screw firing device into projectile. Attach wire to trip wire eyelet in firing device. Remove safety pins and unscrew primer adapter case.

	Length	Width	Height	Weight
Complete device	13/4	10	85/8	35.0
Packing box	2	2	2	1

60 Firing Device, Release Type, M1

a Description and Use. The firing device, release type, M1 is designed to be actuated when a relatively large weight [illegible] is released from the trip wire. The firing device is [illegible] such traps. The firing pin is held at the rear of the firing device by the firing lever which is released from the firing device as long as there is a load greater than 2 pounds on the top face of latch.

b Description. The firing mechanism of this device is cube-shaped, approximately 2 inches square by 4 inches long. It is fitted with a

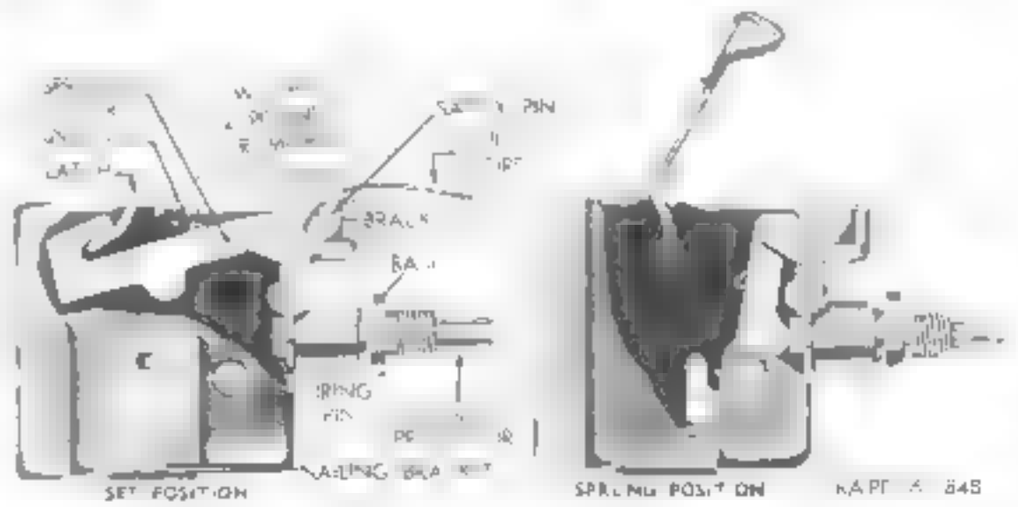


Figure 56. Firing device, release type, M1

cover at one end and a threaded hole to receive a primed coupling base at the opposite end. The body houses a spring lever, a spring, and a firing pin. One end of a steel latch engages a lip on the lever, the remaining portion of the latch rests on top of the device and is secured in place by a safety pin. This arrangement holds the lever in the set position. Two safety holes are provided in the sides of the body, to permit the insertion of a safety pin to engage the lever and prevent it as an additional safety device by intercepting the lever and preventing it from striking the firing pin should premature functioning occur during installation. A strip of metal ¾-inch wide and 4 inches long spot welded to the base of the body serves as a mounting bracket.

c. Functioning. Upon release of restraining weight from the firing device, the lever is rotated counterclockwise through an arc of approximately 25 degrees by the striking spring, which explodes the primer contained in the coupling base.

d. Precautions.

1. Inspection before use. Check firing devices for any obvious defects and to make sure that safety pin is properly installed and that the lever is latched in the set position.

2. Installation and removal.

a. Remove the cotter pin from each end of the safety pin.

b. Straighten and extend wire through interceptor holes.

c. Remove coupling base. Remove the protective cap and replace it temporarily with a blasting cap.

d. Screw the coupling base into the firing mechanism.

e. Screw the firing device assembly into fuze well or cavity of the mine or charge.

(f) **Provide a level surface at the base of the hole in which the mine or charge with firing device assembled is to be placed.** A board may be used for this purpose.

g. Place the assembled mine or charge and firing device in the hole with the striker of the firing device uppermost.

h. Place the restraining weight on the exposed surface of the latch.

Caution: The weight placed on the latch must be greater than 2 pounds to prevent firing device from functioning when safety devices are withdrawn.

i. Make sure that the safety pin cord and interceptor wire are at ground level in position convenient for removal.

j. Conceal the installation.

k. Gently withdraw the safety pin by pulling on its cord. If it does not come out easily, the load on the mine is too light or improperly placed on the latch. If resistance is met, recover and recheck the installation.

l. Withdraw the interceptor wire. It also should come out easily.

3. Removing and removal.

a. Conceal installation.

(b) **Insert a nail or wire through interceptor holes.**

c. Insert safety pin.

d. Remove restraining weight.

e. Remove mine or charge with firing device assembled. Unscrew the firing device from the firing mechanism and coupling base from the mine or charge.

f. Unscrew the coupling base from the firing mechanism.

g. Destroy the coupling base with blasting cap attached or store in a safe place.

Caution: Do not attempt to remove the blasting cap from the coupling base.

(h) **Restore firing mechanism to original condition and packing.**

Packing. Two firing devices packed 4 per wooden ammunition box are packed in one exterior container. Complete firing devices are packed in wooden box. Approximate dimensions (in.) of the box are 24¾ x 9¾ x 8¼. Approximate packing weight is 50 pounds.

Section VII. PERCUSSION PRIMERS

61 Primer, Percussion Cap, M2

The primer cap consists of copper cup, ¼-inch diameter [illegible] cup. It has a ½-inch diameter flange at one end,

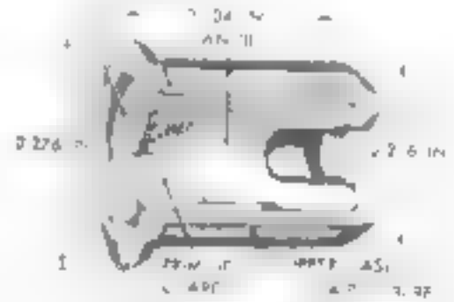


Figure 37 Primer, percussion cap, M2

and a 0.085-inch hole at the other. It contains an inner inverted cup, an initiating charge and staking. The primer produces a small flame when struck by a firing pin, to initiate a blasting cap or igniter charge. Firing devices are issued with this type of primer installed in the coupling base. The primer is also issued separately for repriming firing devices used as training practice mines or with improvised practice mines or booby traps. A fired primer may be punched out of a coupling base from the inside with a rod. Separately issued primers are used for repriming fired firing devices. Before reprimng

activities. A new primer may be inserted in place of the fired primer provided it fits snugly enough to be held tightly in place.

Caution: No attempt will be made to remove an unfired primer from a swaging base.

62. Primer, Percussion Cap, Improved No. 3

This primer is essentially the same as the M42 primer.

Section VIII. BLASTING CAPS

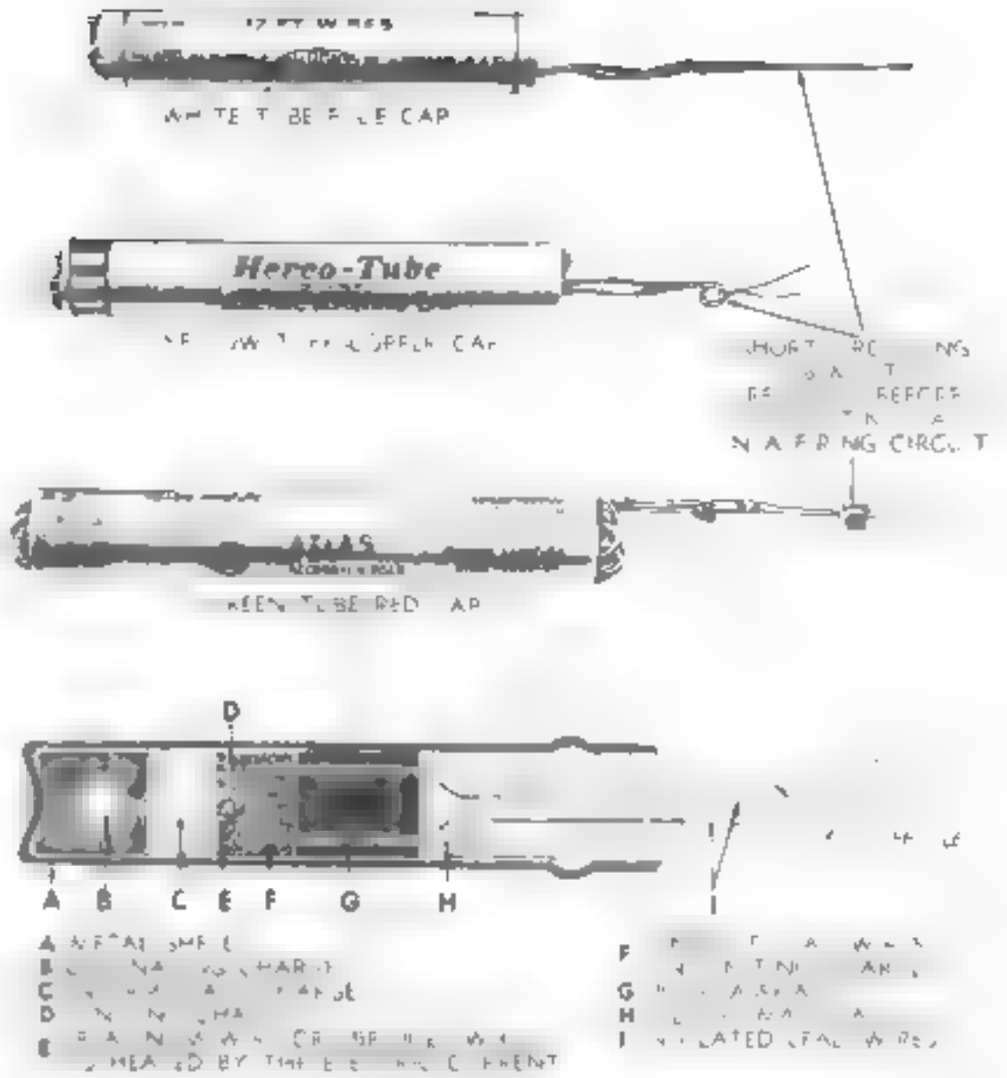
63. General

Blasting caps used for military explosives are the Army types and the commercial type. The Army type consists of a thin tubular metal shell of [illegible] inches long and [illegible] inch diameter, containing an initiating compound and a charge of cyclotol or PETN, with an assembled fuse or lead wire. Blasting caps used for military high explosives also serve as the detonating element for initiation of time fuses. The commercial type is inserted into a hole in which the electric type being used will be fired with the electric blasting machine and the non-electric type is used with standard igniting devices or time blasting fuse. Safety fuse with a fuse igniter. Special Army electric type II or PETN and nonelectric type I or PETN caps, similar in size and shape to the latter caps, illustrated in figure 58, are used to detonate the less sensitive military explosives such as TNT and composition B. Commercial caps, typified by the No. 6 and No. 8, may be used to detonate commercial explosives, such as tetryl, tetrytol, or nitrostarch. The No. 8 cap is more powerful than the No. 6, hence the No. 8 cap may be used to detonate a less sensitive explosive than one which can be detonated by a No. 6 cap. Caps, blasting, No. 8, test, second, third and fourth, may be used to detonate charges of commercial dynamite or straight of detonating cord) in a sequence, especially in quarrying or tunnel driving operations.

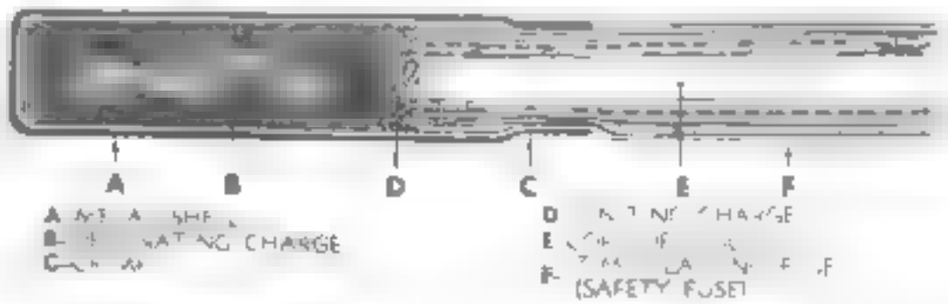
Caution: Blasting caps are extremely sensitive and can explode unless handled carefully. They must be protected from shock and extreme heat and must not be tampered with. They are never to be stored with any other explosives. Caps and explosives must not be carried on the same truck except in emergency.
See FM 5-25, for firing systems and priming.

64. Electric Caps

a. When two or more electric caps are connected in the same circuit they must be the product of the same manufacturer. This is essential to prevent misfires because caps of different manufacturers do not have



CAP BLASTING TETRYL ELECTRIC-
EXTERIORS AND CROSS SECTION



CAP BLASTING NON ELECTRIC CRIMPED TO TIME
BLASTING FUSE SAFETY FUSE-CROSS SECTION RAPD 6877A

Figure 58. Caps, blasting.

the same electric characteristics. A current of at least 0.5 ampere is required to insure detonation of electric blasting caps.

b. Issue electric caps with leg wires of various lengths for connecting them to the circuit. The leg wires of short-circuited caps have a foot or more of bare lead wires. A short circuiting metal or spring fastener holds the loose ends of the wires together. This shunt prevents accidental electrical firing of the cap and must be removed before the cap is connected in a firing circuit.

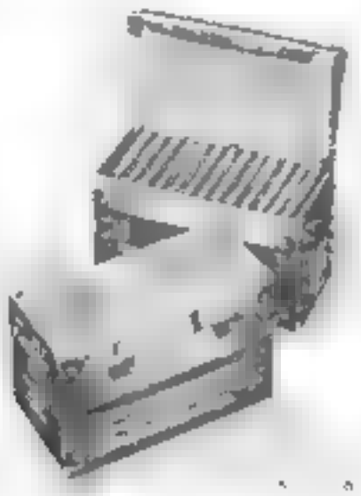


Figure 39. Blasting caps—packed in cartons

65. Nonelectric Caps

Because nonelectric caps are extremely difficult to waterproof, they should not be used in firing charges placed under water or in wet bore holes. Such charges, if they are to be fired successfully, should be primed with the nonelectric blasting cap and the detonating cord well sealed to keep the water from the explosive. If it becomes necessary to use nonelectric caps in damp boreholes, they should be moisture proofed with waterproofing compound and fired immediately after placing.

66. Types

Blasting caps currently used in priming explosives are described in *a* and *b* below.

a. Firing Type.

(1) CAP, blasting, special, electric, Type II (J2 PETN).

(a) CAP, blasting, special, electric, Type II PETN.

(b) CAP, blasting, tetryl-lead azide, waterproof, fuze, igniter, instantaneous, 4 ft lead wires.

(c) CAP, blasting, tetryl, nonelectric.

b. Commercial Type.

(1) CAP, blasting, electric, No. 6, instantaneous.

(2) CAP, blasting, commercial, electric, No. 6, instantaneous, medium length lead wires, 4 ft to 40 ft.

(3) CAP, blasting, commercial, electric, No. 6, instantaneous, long lead wires, 40 ft to 100 ft.

(4) CAP, blasting, nonelectric, No. 6, instantaneous.

(5) CAP, blasting, nonelectric, No. 8, instantaneous.

(6) CAP, blasting, electric, No. 8, 1st delay, 1.0 sec (approx).

(7) CAP, blasting, electric, No. 8, 2d delay, 1.8 sec (approx).

(8) CAP, blasting, electric, No. 8, 3d delay, 1.7 sec (approx).

(9) CAP, blasting, electric, No. 8, 4th delay, 1.8 sec (approx).

(10) CAP, blasting, commercial, electric, No. 8, instantaneous, lead wires, length of lead wires 4 ft to 40 ft.

(11) CAP, blasting, commercial, electric, No. 8, instantaneous, long lead wires, 40 ft to 100 ft.

(12) CAP, blasting, nonelectric, No. 8, instantaneous.

67. Caps for Positive Detonation

The types of caps required for positive detonation of various explosives are given in table I, appendix A.

68. Charge, Propelling, M12 (T1), With Primer M44, for Rod, Earth, Blast-Driven

This item is described under ROD, earth, blast-driven (para. 9 or 10).

Section IX. ACCESSORIES

69. General

This section pertains to accessories used to complete and explosive items. These accessories consist of explosives such as tetryl pellets, special tools or fixtures, charges, and related items.

70. Adapter, Priming, M1A4

The priming adapter is a plastic hexagonal-shaped device, approximately 1 inch long, 0.7 inch across the flat portion of the hexagon, shaped for ease of handling, and with both ends being threaded to be fastened to the female threads of the cap well and the destructor M10 (par. 73). A shoulder inside one end is large enough to permit the fuze or detonating cord to pass through but too small for an M6 special blasting cap. The adapter is provided for the use of bare wires of an electric blasting cap to be inserted easily and quickly. The exagon shaped center can be conveniently handled by gloved hands. This item replaces adapters M1A1 and M1A2. It simplifies the priming of military explosives using threaded cap wells and utilizing Army special blasting caps, both electric and nonelectric.

71 Adapter, Priming, M1A3

The priming adapter [illegible] explosives having threaded cap wells. It is a plastic cylinder approximately 3/4 inch long with a tubular axial hole through it. A shoulder is near the center to prevent the blasting fuse or detonating cord from passing through, but not small for a blasting cap. The outer end is threaded with a 9/16-inch external thread, which fits the internal thread of threaded cap wells. The adapter is slotted longitudinally so that the wires of an electric blasting cap can be inserted easily and positively. The priming adapter is used as indicated in *a* through *e* below.

a. With Electric Blasting Caps.

(1) Pass cap wires of the electric cap through the hole of priming adapter.

(2) Pull cap into adapter.

(3) Insert prepared fuse well of explosive.

(4) Screw the adapter into the well.

b. With Nonelectric Blasting Caps and Safety Fuse. [illegible]

(1) Pass the safety fuse through the adapter.

(2) Crimp the blasting cap to the fuse.

(3) Pull the cap into the adapter.

(4) Insert cap through well of explosive and screw adapter into place.

c. With Detonating Cord.

(1) Cut off a short piece of detonating cord for each well to be primed, or [illegible].

(2) Use same method as for nonelectric caps and safety fuse.

Note. Detonating cord should be used with TNT only when sufficient explosive power is not available from other sources.

72. Adapter, Priming, M1A2

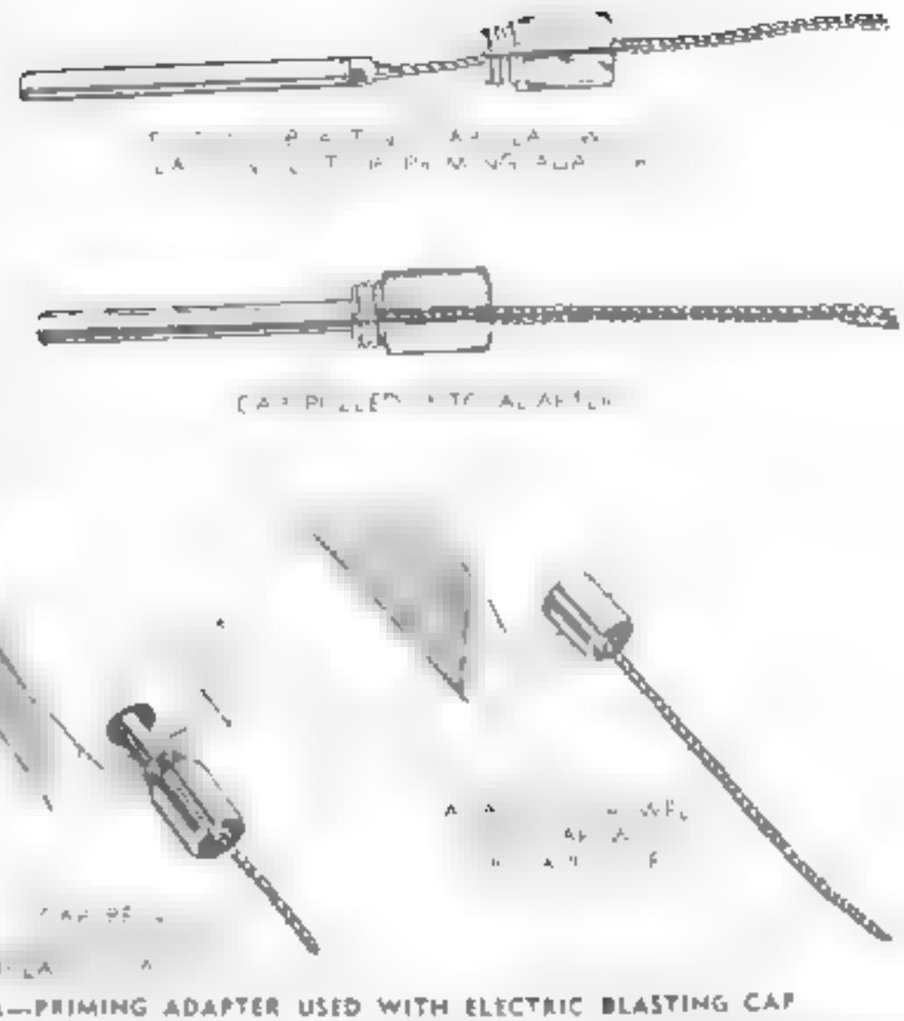
This adapter is the same as that described in paragraph 71 except for minor details.

73. Destructor, High-Explosive, Universal, M10

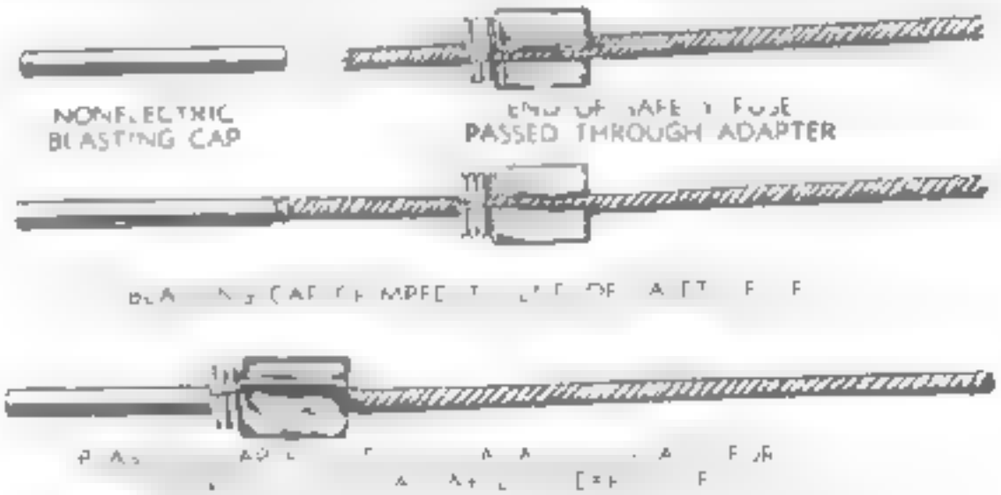
a. General.

(1) The universal high explosive destructor M10 is a high explosive charge initiated by means of blasting caps or mechanical detonators and standard firing devices. Destructors are issued with demolition sets No. 1, 2, or 3.

(2) The destructor M10 is essentially an adapter bonded with a threaded casing that will hold 1.5 pounds of tetryl and a threaded fuse well. It is used primarily



A—PRIMING ADAPTER USED WITH ELECTRIC BLASTING CAP



B—PRIMING ADAPTER USED WITH NONELECTRIC BLASTING CAP AND SAFETY FUSE

FIGURE 4. Use of adapter, priming, M1A3, in the electric and nonelectric blasting caps and with safety fuse and detonating cord (PRIMA 1RD).

loaded projectiles and bombs as improvised mines booby traps, and demolition charges. It is also used by disposal units to destroy deteriorated or abandoned ammunition.

b. Description. This destructor (fig. 41) is composed of parts listed in (1) through (6) below.

(1) Plastic loading plug (similar to the loading plug for detonator M1).

(2) Standard packing adapter.

(3) Blasting cap bushing.

(4) Activator housing.

(5) Two booster cups, containing tetryl pellets.

(6) Ammunition loading tube for use with projectiles or bombs that have a 2" or smaller diameter recessed fuse well. The booster cavities of mortar and large projectiles should be filled

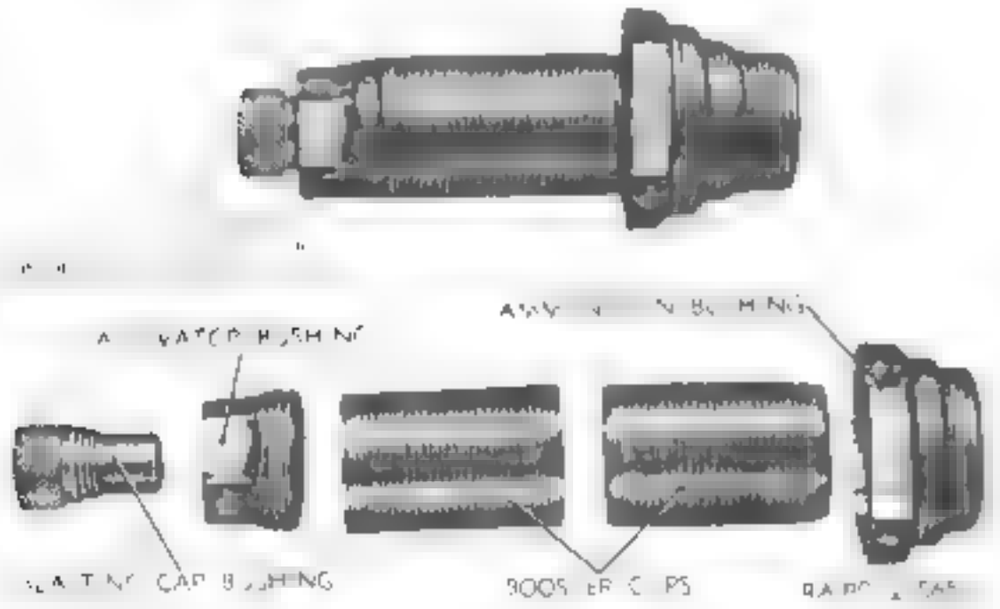


Figure 41. Destructor, high explosive, universal, M10.

to the full depth by adding booster cups to the destructor M10 as required.

c. Safety Precautions. Safety distance requirements for preparation of primers and demolition charges as set forth in TM 9-1900 must be observed when preparing the universal destructor M10 for use.

74. Adhesive, Paste, for Demolition Charges, One-Half Pound Can, M1

a. Adhesive compound is a sticky puttylike substance issued in some demolition sets for attaching charges to vertical surfaces or to overhead flat surfaces. It is useful in mounting charges while tying them in place or, under some conditions, in tying charges without tying

charges are held in place from several minutes to several days depending on the size and shape of the charge and the surface to which it is attached.

(1) The adhesive compound will hold a single thickness of explosive blocks on wood, steel, or concrete for several days.

(2) The adhesive compound will not alter explosives chemically, wet or dry.

(3) The compound becomes stiff and hard at temperatures at or below freezing and loses adhesive quality.

(4) The adhesive compound is softened by water and becomes useless if wet.

75. Bag, Canvas, Carrying, Demolition Equipment

The bag consists of a rectangular canvas receptacle with a shoulder strap and adjusting buckle. It is used for carrying the components of DEMOLITION EQUIPMENT SET NO. 1 or individual supplies.

76. Boxes for Blasting Caps

Especially designed empty boxes of various sizes and types are provided for certain equipment sets to hold detonators and fuses. These boxes are made of metal or wooden boxes with telescoping covers. Holes in the bottom and sides of the box are to provide for ventilation. The boxes are marked to indicate the contents before packing. The available blasting cap boxes are described in *a* and *b* below.

a. Box, Cap, Detonator, Electric, Instantaneous. This box is one of the items of explosive equipment of DEMOLITION EQUIPMENT SET NO. 1 (par. 69), ROD, earth, (box, cover, Set No. 1 fig. 45) and DEMOLITION EQUIPMENT SET NO. 1, engineer squad (fig. 47).

b. Box, Cap, Detonator, Electric, Fuse Igniter. This box is one of the items of explosive equipments of DEMOLITION EQUIPMENT SET NO. 1, engineer platoon (fig. 48).

77. Case, Leather, Galvanometer, Blasting, Type I, With Leather Carrying Strap

This is a leather case with leather shoulder strap for carrying and protecting the galvanometer and other items used for testing electrical circuits and their components. This item may be requisitioned separately for replacement purposes when necessary. The case has an opening in one end to register with the scale of the galvanometer. By lifting the cover of the case to expose the terminals the galvanometer can be used without its removal from the case. The case should be used and stored under as free from dirt as practicable.

78 Chests (Demolition)

a. CHEST, Demolition Squad. The chest used to hold the components of DEMOLITION EQUIPMENT SET NO. 1, engineer squad (fig. 47). The dimensions of the chest are approximately 7 x 15 x 19". Partitions are arranged especially for keeping components of the set in order.

b. CHEST, Demolition Platoon Engineer M1951. This chest is used to hold the components of DEMOLITION EQUIPMENT SET NO. 2, engineer platoon (fig. 48). The dimensions of the chest are 3-3/4 x 17-1/2 x 20-1/4". Partitions are arranged especially for keeping components of the set in order.

79 Clip, Cord, Detonating, M1

This is a metal clip used to hold detonating cord for firing charges (see figure 51).

80. Compound, Sealing, Blasting Cap, Waterproof, ½-Pint Can

This compound is waterproof when applied as directed. It softens fuse and cap wells, making it possible to push primers into them. It does not make a permanent waterproof seal between primer and cap well. It is used to waterproof primers.

81 Galvanometer, Blasting (W/Leather Case and Carrying Strap)

This galvanometer is used to test firing circuits and cells, and to check the continuity of firing circuits. When the terminals are joined by a closed circuit, the flow of current through the galvanometer causes the needle to deflect. The amount of deflection indicates the strength of the current.

It is important to test the strength of the firing current before firing the charges. This is done to make sure that there is enough current to detonate the caps. Some dry cell batteries, especially those that have been in storage for a long time, may be too weak to detonate caps. This is because other cells may be strong enough to detonate a cap. The galvanometer is the only reliable method of testing firing circuits except to replace a weak cell.

Keep the galvanometer from freezing. Warm it before using if it has been exposed to temperatures below 0° F. When not in use, keep the galvanometer in its case to protect it from freezing, breakage, and corrosion.

A leather carrying strap is provided with the galvanometer. It has a snap hook for attachment to the case or the user's belt.

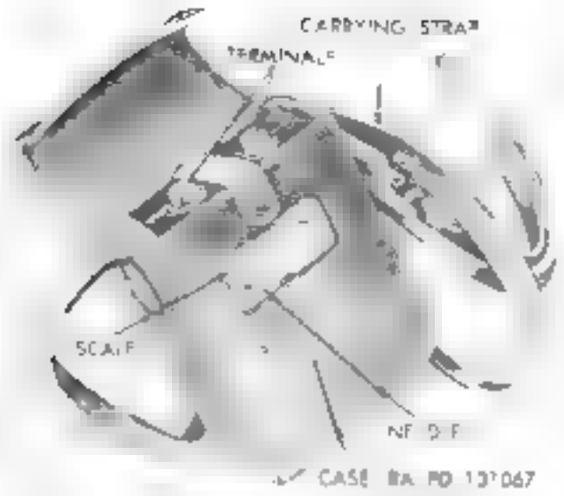


Figure 42. Galvanometer and carrying strap.

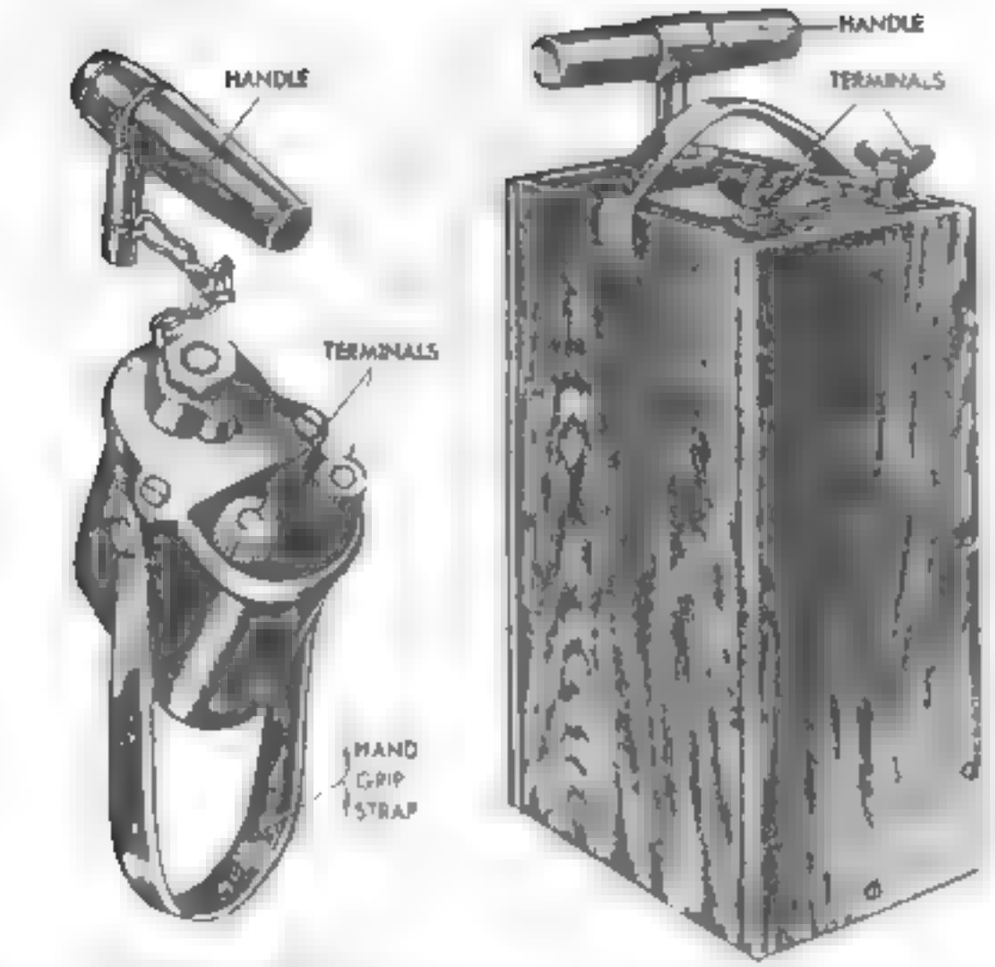
Be sure the galvanometer is tested for firing circuits and cells as specified in FM 5-25.

82 Machine (Blasting)

Electric blasting machines are small generators that produce current for firing electric blasting caps. There are two types in Army use: the hand-operated type and the capacitor discharge type. Only the hand-operated type is issued with DEMOLITION EQUIPMENT SETS NO. 1 and NO. 2. The capacitor discharge type is issued with DEMOLITION EQUIPMENT SET NO. 3. Use the blasting machine as directed below.

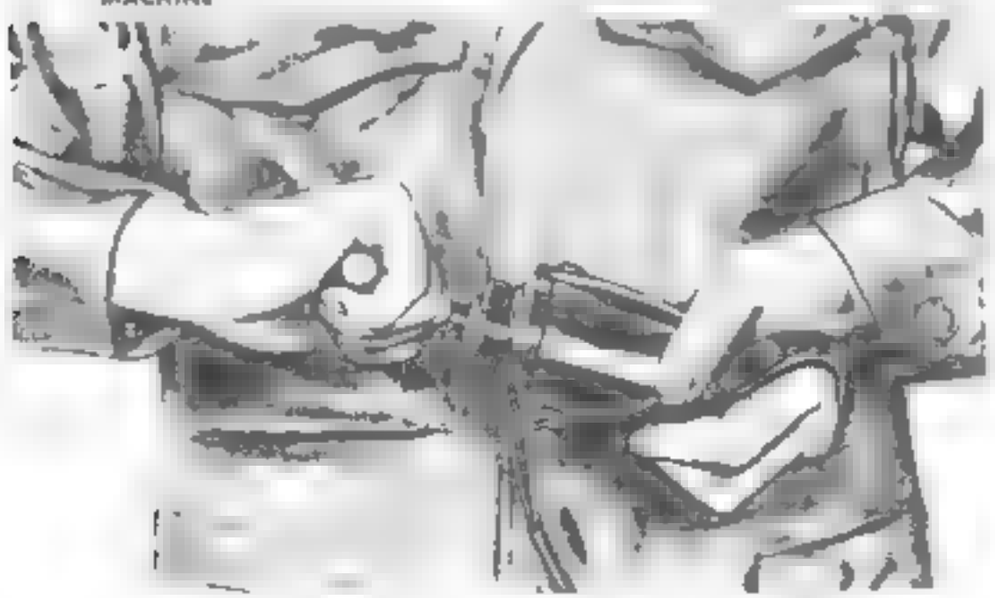
a. Inspection. Inspect the blasting machine to be sure it is working properly and that loose parts are tightened before firing the charges. Inspect the firing wires for breaks in insulation. With the handle of the generator in the firing position, the terminals are short-circuited. This prevents the machine from firing any caps that may be connected to the firing wires.

b. Firing. When firing charges with the blasting machine, follow the instructions for the type of operation involved. Be sure to connect the firing wires to the terminals of the machine before connecting them to the charges. Push the handle all the way down with a quick, forceful stroke. Do not pump the handle up and down. Pumping the handle does not produce enough current to fire the caps.



A—TEN-CAP BLASTING MACHINE

B—THIRTY-CAP BLASTING MACHINE



C—METHOD OF USING 10-CAP BLASTING MACHINES

RA PD 131068

Figure 43. Blasting machines.

a. Ten-Cap and Thirty-Cap Blasting Machine. The 10-cap blasting machine is similar to the 30-cap machine except for size and weight, and is operated in a similar manner. It weighs 4½ pounds and will fire 10 caps properly connected in series.

c. Testing. Blasting machines should be frequently tested for capacity with a rheostat connected in series with the machine and with a circuit of electrically connected electric blasting caps. See paragraph 84, for description of rheostat used with blasting machines.

d. Operational Precautions.

(1) Blasting machines are of one-way plunger-type construction but they possess a relatively delicate, electrical mechanism, hence they should be treated with care.

(2) **No attempt will be made to disassemble or repair a blasting machine.**

(3) Charging of the plunger will be performed by a qualified person only.

(4) When not in use, machines will be stored in a cool, dry, clean, and safe place.

(5) Directions for care and use of the plates attached to each machine should be followed carefully.

83 Reels and Spools

a. Kinds. Wire reels are of two kinds, the [illegible] wire reel and the firing wire reel (fig. 44). The [illegible] wire reel consists of a spool, a handle assembly, and a [illegible]

[illegible] feet [illegible] The [illegible] end encircles a bearing assembly, consisting of a brass housing [illegible] axle.

[illegible] one end and a hole near the other end receives a cotter pin, [illegible]

[illegible] Handles. This firing wire reel (fig. 45) is a metal drum mounted on [illegible] The [illegible]

[illegible]. [illegible] the item described in *b* above, except that it is empty and has a capacity [illegible]

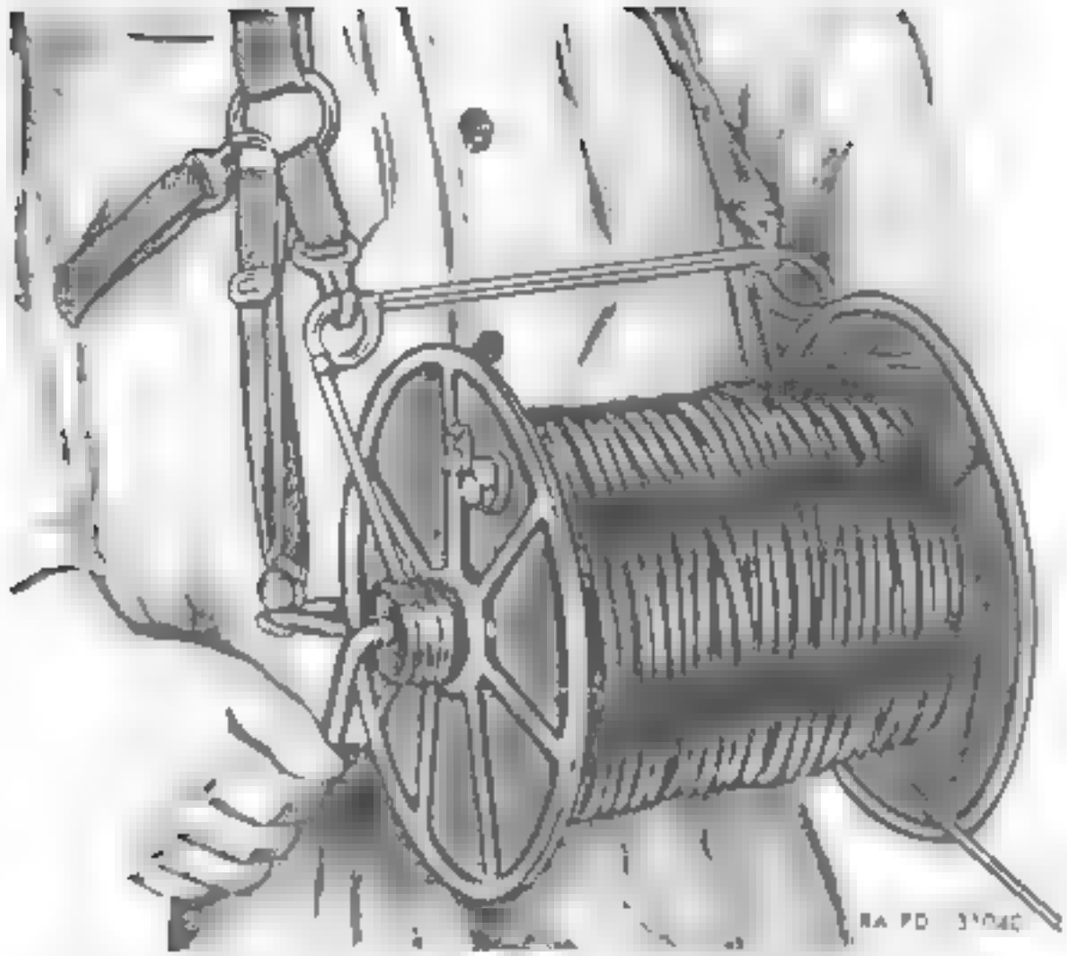


Figure 44. Reel assembly, wire, firing 500 foot, RI-554, with carrying straps and cover.

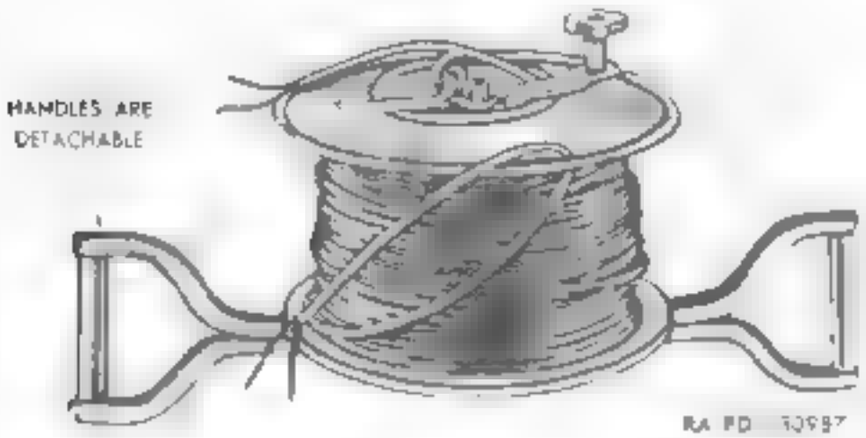


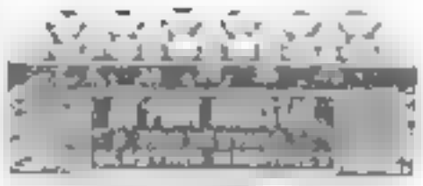
Figure 45. Reel assembly, wire, firing 5,000 foot, with two detachable D-shaped handles.

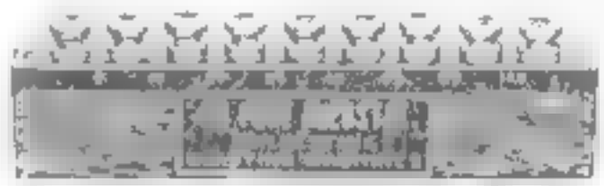
84. Rheostats

There are two types of rheostats used in the Army for testing blasting circuits: the six post and the nine post rheostat.

a. RHEOSTAT, Blasting Machine Testing, 6 Post.

(1) Description. The rheostat consists of a series of coils of resistance wire wound on a rectangular block type base. Six brass binding posts are mounted on the top of the case. One end of the resistance wire is connected to one terminal of the binding posts. Switches on the front of the case connect the other terminal of the binding posts to the resistance wire. Switches are provided so that any pair of posts may be connected in series, leaving the same resistance in the circuit between any pair of posts. The number of caps in series having a resistance equal to the resistance between the posts of any pair of posts may be fired by connecting the caps between the posts of the pair.





(2) Use.

(a) Connect the rheostat in series with a circuit of several blasting caps, themselves in series. Operate the blasting machine

(b) Connect the rheostat in series with a circuit of several blasting caps, themselves in series. Operate the blasting machine

85. Twine and Tape, Friction, General Use, Grade A, ¾-Inch Wide, ½-Pound Roll

Twine and friction tape are included in demolition sets, to fasten caps to detonating cord, insulate electrical connections, fasten charges in place, tie or tape blocks of explosive together into a compact package, and miscellaneous uses.

86. Wire (Annunciator and Firing)

Firing wire for electric firing of charges is issued in 500 foot lengths of 2-conductor, No. 18 AWG plastic- or rubber-covered wire. The wire is carried on one of the reels described in paragraph 83. In setting off charges, two reels of wire may be required to reach a safe distance. Single-conductor No. 20 AWG annunciator wire is issued for making connections between electric caps or between cap and firing wire. See FM 5–25 for use of these wires in electric firing systems:

WIRE, annunciator, single-conductor, cotton covered, 200-foot roll, No. 20 AWG.

WIRE, firing, 2-conductor, rubber covered, 500-foot roll, No. 18 AWG. This 500-foot roll may be issued for use with reel shown in figure 45 only.

WIRE, firing, 2-conductor, vinyl polymer covered, 500-foot roll, No. 20 AWG.

WIRE, firing, 2-conductor, vinyl polymer covered, 500-foot roll, No. 18 AWG.

Section X. TOOLS

87. Crimper, Cap (W/Fuse Cutter) M2

a. This crimper (BB, fig. 47) is designed to squeeze the shell of the nonelectric cap tightly enough around safety fuse or time blasting fuse or detonating cord to prevent it from being pulled off easily and still not interfere with the burning of the powder train in the fuse. The lower portion of the jaws of the crimper are shaped and sharpened for cutting fuse. One leg of the handle is pointed for punching holes for caps in dynamite cartridges. The other leg has a screwdriver end.

b. The cutting jaws must be kept clean and must be used only for cutting fuse or detonating cord. The cap primer must not be used as pliers.

c. The crimper M2 has a narrow jaw that crimps a water-resistant groove completely around the cap. Earlier model cap crimpers have wider crimping jaws, which form a sleeve at the open end of the cap. Both crimpers are constructed so the jaws cannot be closed tightly enough to injure the cap or fuse.

88. Knife, Pocket, General Purpose, 74–K–65

This pocket knife is a component of DEMOLITION EQUIPMENT SETS NOS. 1 and 2.

89. Pliers, Lineman's, Side-Cutting, Length 8 Inches

This item (CC, fig. 47) is a component and replacement item for DEMOLITION EQUIPMENT SETS NOS. 1 and 2. The item can also be used separately.

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CHAPTER 4

DEMOLITION EQUIPMENT—SETS AND KITS

Section I. DEMOLITION EQUIPMENT SETS

90. General

Demolition sets described in this section are made up of demolition explosive items, accessories, and tools selected from those described in paragraph 19 through 89, with especially designed containers and carrying attachments for the efficient performance of particularly designated demolition tasks.

91. Demolition Equipment Set No. 1, Engineer Squad

The individual items in this set are described separately in this manual. The set (fig. 47) consists of the items listed below:

Note. The item letters are keyed to figure 47.

Item letter	*Item*
A	3 BOX, cap, 10-cap capacity, infantry
B	5 FIRING DEVICE, pull-friction type, M2
C	30 CLIP, cord, detonating, M1
D	5 FIRING DEVICE, pressure type, M1A1
E	10 DETONATOR (five 15-sec delay, M1, and five 8-sec delay, M2)
F	1 CHEST, demolition squad
G	1 REEL, wire, firing, 500 ft, RL–39A, w/2 carrying straps, w/winding device, w/o spool, w/o wire, and 1 SPOOL, DR-8A, empty, reel, wire, firing, 500 ft
H	1 BLOCK, demolition, chain, M1 (eight 2½-lb block strung on cord, detonating)
J	1 WIRE, firing, 2-conductor, vinyl polymer covered, 500-ft roll, No. 18 AWG
K	2 WIRE, annunciator, single-conductor, cotton covered, 200-ft roll, No. 20 AWG
L	1 FUSE, safety, M700, or FUSE, blasting, time (50-ft coil)
M	30 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M12
N	30 CAP, blasting, special, nonelectric (type I (J1 PETN))
P	1 KNIFE, pocket, general purpose, 74–K–65 (stored, issued, and reviewed by Quartermaster Corps)
Q	8 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
R	8 BLOCK, demolition, M2 (2½-lb block)
S	3 CORD, detonating (PETN) (100-ft spool)
T	1 TWINE, hemp, No. 18, 4-oz ball
U	1 MACHINE, blasting, 10-cap capacity, class A

Item letter	*Item*
W	3 TAPE, friction, general use, grade A, ¾ in. wide, ½-lb roll
X	1 GALVANOMETER, blasting (w/leather case and carrying strap)
Y	30 EXPLOSIVE, TNT, 1-lb block
Z	40 LIGHTER, fuse, weatherproof, M2
AA	25 CAP, blasting, special, electric (type II (J2 PETN))
BB	2 CRIMPER, cap (w/fuse cutter), M2
CC	1 PLIERS, lineman's, side-cutting, length 8 in. 2 DESTRUCTOR, high-explosive, universal, M10 (T20)

92. Demolition Equipment Set No. 2, Engineer Platoon

The individual items in this set are described separately in this manual. The set (fig. 48) consists of the items listed below:

Note. The item letters are keyed to figure 48.

Item letter	*Item*
A	2 BOX, cap, 50-cap capacity, engineer
B	60 CLIP, cord, detonating, M1
C	15 FIRING DEVICE, pressure type, M1A1
D	10 DETONATOR, 15-sec delay, M1
E	1 REEL, wire, firing, 500 ft, RL 39A, w/o carrying straps, w/winding device, w/o spool, w/o wire, and 1 SPOOL, DR–8A, empty, reel, wire, firing, 500 ft
F	3 BLOCK, demolition, chain, M1 (eight 2½-lb block strung on cord, detonating)
G	1 WIRE, firing, 2-conductor, vinyl polymer covered, 500-ft roll, No. 18 AWG
H	2 WIRE, annunciator, single-conductor, cotton covered, 200-ft roll, No. 20 AWG
J	1 CHEST, demolition platoon, engineer, M1931
K	3 FUSE, safety, M700, or FUSE, blasting, time (50-ft coil)
L	10 DETONATOR, 8-sec delay, M2
M	2 KNIFE, pocket, general purpose, 74–K 65 (stored, issued, and reviewed by Quartermaster Corps)
N	100 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, priming, M1A2
P	100 CAP, blasting, special, nonelectric (type I (J1 PETN))
Q	15 FIRING DEVICE, pull-friction type, M2
R	3 CORD, detonating (PETN) (100-ft spool)
S	24 BLOCK, demolition, M2 (2½-lb block)
T	24 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
V	1 MACHINE, blasting, 10-cap capacity, class A
W	3 TWINE, hemp, No. 18, 4-oz ball
X	1 PLIERS, lineman's, side-cutting, length 8 in.
Y	2 CRIMPER, cap (w/fuse cutter), M2
Z	100 CAP, blasting, special, electric (type II (J2 PETN))
AA	100 LIGHTER, fuse, weatherproof, M2
BB	4 TAPE, friction, general use, grade A, ¾-in. wide, ½-lb roll
CC	1 GALVANOMETER, blasting (w/leather case and carrying strap)
DD	100 EXPLOSIVE, TNT, 1 lb block 4 DESTRUCTOR, high-explosive, universal, M10 (T20)

Figure 97 Demolition equipment set No. 1 Engineer Squad

Figure 98 Demolition equipment set No. 2 Engineer Platoon

93 Demolition Equipment Set No 5, Individual

The individual items in this set are described separately in this manual. The set (fig 49) consists of the items listed below.

Note. The key letters are keyed to figure 49.

Key letter	Item
A	10 LIGHTER, fuse, weatherproof, M[illegible]
B	2 FIRING DEVICE, pressure type, M1A1
C	8 BLOCK, demolition, M3 (COMP C3) (2¼-lb block)
D	1 [illegible] detonating, M[illegible]
E	2 FIRING DEVICE, pull-friction type, M2
F	10 ADAPTER, priming, M1A4, or ADAPTER, priming, M1A3, or ADAPTER, [illegible] M1A[illegible]
G	2 CRIMPER, cap (w/fuse cutter) M2
H	1 CORD, detonating (PETN) (100-ft spool)
J	2 BAG, canvas, carrying, demolition equipment
K	1 FUSE [illegible] M700 [illegible] FUSE [illegible]
L	[illegible]
M	4 DETONATOR, 15-sec delay, M1
N	2 TAPE, friction, general use, black, width ¾-in., 8 oz roll
P	[illegible] ADHESIVE [illegible] charges [illegible] M1
	1 BOX, cap, 10-cap capacity, infantry
	[illegible]

94 Demolition Equipment Set No. 7, Electrical

[illegible] individual items in this set are described separately in this manual. The set [illegible] consists of the items listed below.

Note. The key letters are keyed to figure 50.

Key letter	Item
A	1 MACHINE, blasting, 10-cap capacity, class A, w extra handle
B	[illegible]
C	[illegible] ADAPTER, priming, M[illegible] ADAPTER [illegible] ADAPTER [illegible] M1A2
D	[illegible]
E	[illegible] WIRE [illegible] No. 20 AWG
F	1 BAG, canvas, carrying, demolition equipment

Section II ROD, EARTH, BLAST-DRIVEN, SET NO 1

95. General

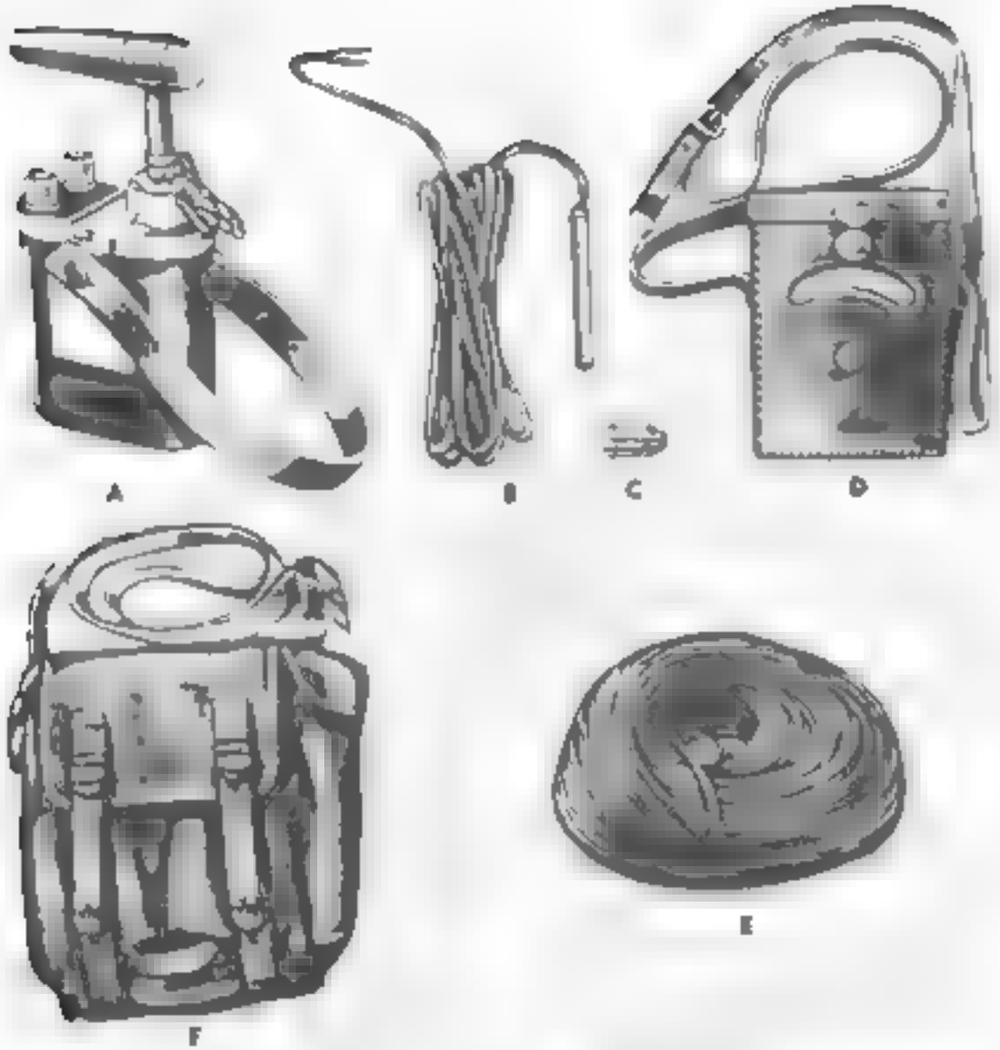
This set (fig [illegible]) is used for making holes for demolition [illegible] [illegible] purposes as deep as [illegible] 26 [illegible] several [illegible] rock or other hard material.

96. Description

[illegible] set [illegible] explosive [illegible] paragraph [illegible] feet [illegible] inches [illegible] diameter [illegible]

A LIGHTER, FUSE, WEATHERPROOF, M2
B FIRING DEVICE, PRESSURE [illegible]
C BLOCK, DEMOLITION, M3
D [illegible] DETONATING [illegible]
E FIRING DEVICE, PULL [illegible]
F [illegible] EXPLOSIVE M1A2
G CRIMPER, CAP [illegible]
H [illegible]
J BAG, CANVAS, CARRYING, DEMOLITION EQUIPMENT
K [illegible]
L CAP, BLASTING, SPECIAL [illegible]
M DETONATOR, 15-SEC DELAY, M1
N TAPE, FRICTION, GENERAL USE, BLACK, WIDTH ¾ IN., 8 OZ ROLL
P ADHESIVE PASTE FOR DEMOLITION CHARGES [illegible]
Q [illegible]

Figure 49. Demolition equipment set No. [illegible] individual.



A MACHINE BLASTING CAP CAPACITY CLASS A W EXTRA HANGLE
B CAP BLASTING SPECIAL ELECTRIC 24 PETN
ADAPTER PRIMING MAGAZINE OR ADAPTER PRIMING
C MAGAZINE OR ADAPTER PRIMING MAG
D GALVANOMETER BLASTING WEATHER CASE AND CARRYING STRAP
WIRE FIRING 2 CONDUCTOR VINYL POLYMER COVERED
E 500-FT ROLL NO 21 AWG
F BAG CANVAS CARRYING DEMOLITION EQUIPMENT

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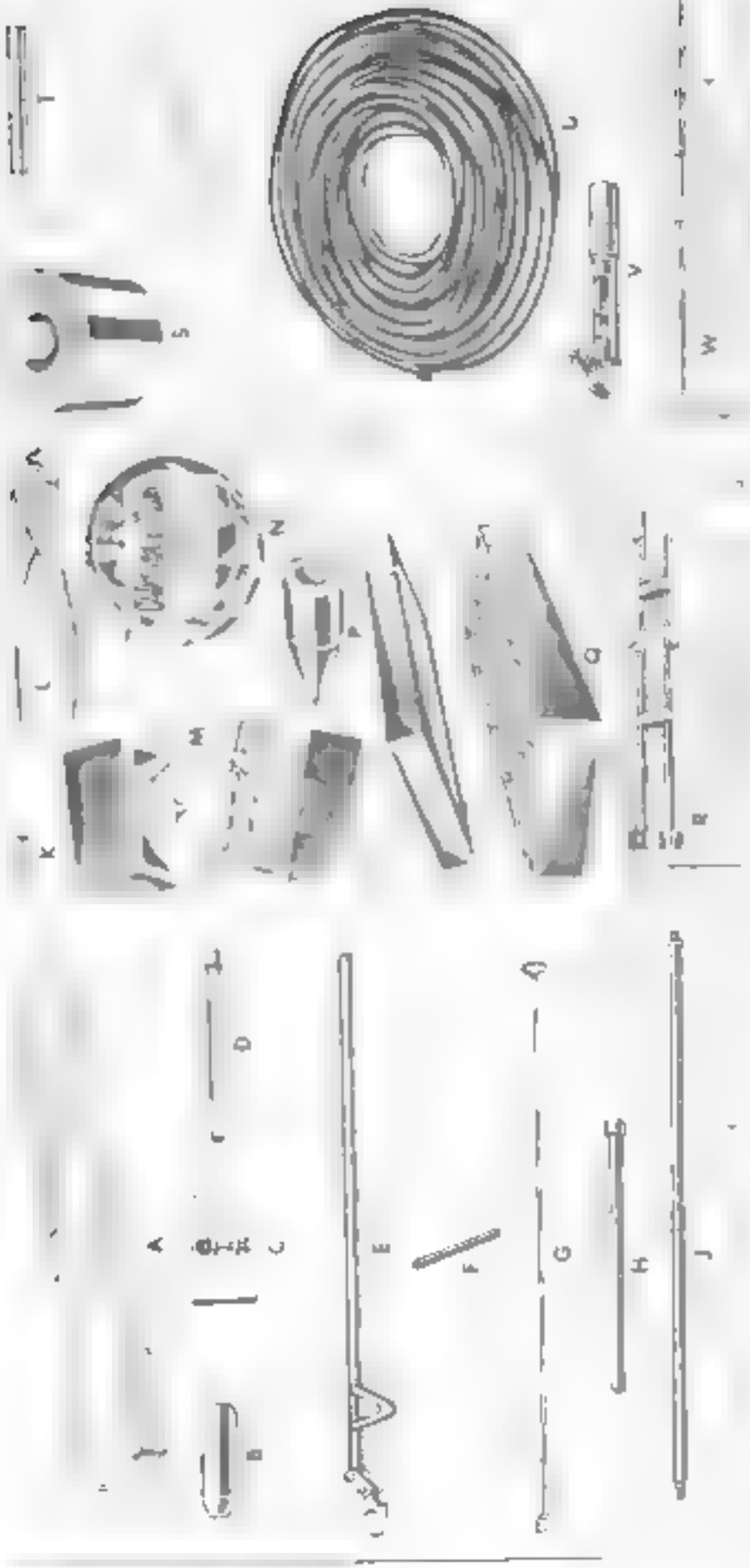
Figure 56. Demolition equipment set No 7 electrical



NONEXPLOSIVE ITEMS

Figure 1. Red cotton blasting

the lower end of the rod and a cylindrical firing chamber, 15 inches long and 4⁹⁄₁₆ inches OD, screws on the upper end of the rod. Propelling charge M12 when placed in the firing chamber and exploded by primer M44, which is attached to a piece of time blasting fuse (safety fuse) and a fuse lighter (par. 97*b*), drives the rod into the earth. A removable handle, which fits through holes in the walls of the firing chamber, an extractor, which is for gripping and lifting the rod, and an extension which is for lengthening the rod, are used to pull the rod from the earth. The tripod furnished with the set consists of a 4¾-inch ring supported on three adjustable legs. In order to hold the rod steady for firing, the firing chamber, when assembled to the rod, is held within the ring of the tripod, which is centered over the point where the hole is to be made. CHARGE, springing, is furnished with the set for enlarging the diameter of the hole, made by the main rod and point, throughout its depth. A forked inserting rod is furnished for inserting an improvised springing charge, made up of a bundle of detonating cords, into the hole made by the main rod and point. Such improvised charges may be used as an expedient for springing holes of various diameters (depending on the number of detonating cords used in the bundle) when a regular CHARGE, springing, is not available. The blasting caps and safety fuse or time blasting fuse furnished with the set are used for detonating either the regular CHARGE, springing, or for detonating an improvised springing charge.

97. Components

Note. The item letters in *a* and *b* below are keyed to figure 51.

a. Nonexplosive Items.

Item letter	Item
A	1 CHEST
B	1 CHAMBER, firing
C	1 PLATE, base, extractor, assy
D	1 ROD, extension
E	1 EXTRACTOR, rod
F	1 ROD, handles and starting
G	1 ROD, inserting
H	2 ROD, intermediate
J	2 ROD, main, long
K	100 ADAPTER, firing, explosive, M1A3 or M1A4
L	1 CRIMPER, cap, M2 (w/fuse cutter)
M	1 BOX, cap, 10-cap capacity, infantry
N	2 TAPE, friction, general use, black, ¾-in. wd, 8 oz roll
P	100 POINT
Q	2 BOX, cap, 50-cap capacity, engineer
R	1 TRIPOD

b. Explosive Items.

Item letter	Item
S	100 CHARGE, propelling, M12(T1) (w/primer, M44)
T	100 CAP, blasting, special, nonelectric (type I (J1 PETN))
V	2 FUSE, safety, M700, or FUSE, blasting time, 50-ft coil
U	200 LIGHTER, fuse, weatherproof, M2
W	100 CHARGE, springing

98. Functioning and Use

The blast-driven earth rod is used as indicated in *a* through *g* below.

a. Prepare a conical depression about 8 inches deep and 30 inches in diameter at place where hole is desired. Insert the end of the 1¼-inch handle and starting rod into one of the points and drive it about 8 inches vertically into the center of the depression. Remove the handle, leaving the point at the bottom of the hole. Fit a main rod into the point, tamping around rod to hold it erect. Set the tripod so that its collar is in position to hold the firing chamber and rod steady in a vertical position.

b. The propelling charge (M12) is highly flammable. *No smoking should be permitted while handling it.* Unscrew the small metal cap from a can containing a propelling charge and punch a hole through the cap. Insert primer M44, attached to a length (at least 12 in.) of time blasting fuse or safety fuse into the propelling charge, which consists of loose smokeless powder M2, slip the cap of the can over the fuse, and screw the cap to the can.

c. Place the propelling charge in the bottom of the firing chamber and tamp the charge with earth or sand.

Caution: The space at the bottom of the firing chamber below the level of the shoulder should be empty and free from tamping material or water before placing the propelling charge can into place.

The firmness of tamping required depends on the character of the soil into which the rod is to be driven. Never use a charge other than CHARGE, propelling, M12, with primer, M44, with this set. Test shots are necessary to determine the tamping required. Screw the firing chamber tightly to the top of the rod, adjusting the tripod, if necessary, in order to hold the firing chamber firmly in position. Attach LIGHTER, fuse, weatherproof, M2, to the length of time blasting fuse (safety fuse). Operate the lighter and take cover or retire 25 yards until the charge fires.

d. To remove the rod from the ground, fit the gripper of the rod extractor around the rod and lift it from the hole. The base plate is placed on the ground beneath the purchase (pry) leg of the extractor for support, with the bolt of the base plate passing between the branches of the purchase leg. If the rod is buried too deep to be reached with the extractor, remove the firing chamber and place an extension on the end of the rod. The point is expendable and need not be recovered.

e. To spring the hole, using CHARGE, bringing lower or gently push one or more charges, as required, into the hole made by the rod. The charges are in cylindrical containers about 1 inch in diameter. Attach a blasting cap, crimped to a length (at least 12 in.) of time blasting fuse (safety fuse) to the uppermost charge in the hole, in the place of the plunger provided. Attach LIGHTER fuse (weather proof) to the length of time blasting fuse (safety fuse). Operate the igniter and take cover. Detonation results in a large hres. Additional charges may be used in the same hole to increase the diameter of the hole as desired.

Caution: Wait one-half hour between unsuccessful firings of the same hole so that it may cool to a safe temperature. Water may be poured into the hole to speed the cooling if desired.

f. To spring the hole without a plunger, spring a charge halfway up the hole. Several strands of detonating cord (several lengths of detonating cord for deep holes) are twisted with several turns of friction tape or electrical tape to hold them together tightly at the center of the hole. This is to give a concentration of explosive force at the center of the charge. The number of strands of detonating cord used depends on the diameter of the charge hole and their length depends on its depth. Fifteen strands of detonating cord (each 18 inches long) will break a hole in average ground. If a larger hole is required, use several charges, one on top of the other. Use the same procedure as in *e* above. Repeated firings may be made as in *e* above, observing the same precautions.

If the hole is to be sprung by means of a primer, use the sprung charge with the primer as in *e* above. Repeated firings may be made in *e* above, observing the same precautions.

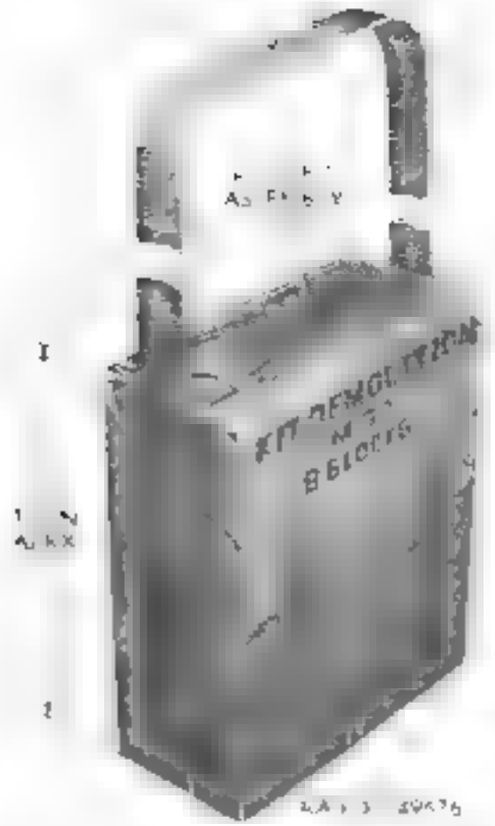
99 Packing

The set is packed in a wooden box. The inside dimensions of the box are $7\frac{3}{16}$ x $11\frac{3}{16}$ x $5\frac{5}{8}$, the cover being chained to bottom of box. The [illegible] is provided to grip the [illegible] in the open position.

Section III KIT, DEMOLITION, M37

100 Description

The kit (figs. 52 and 53) consists of a set of eight demolition blocks M5A1, eight demolition block assemblies M6, M5 assembly, and two priming assemblies M1. The demolition block M5A1, which



[illegible]

The purpose of [illegible] is to [illegible], priming assembly M1, [illegible] of time blasting fuse, and [illegible] to the end of which is attached a blasting cap. The priming assembly M1 consists of one pound of explosive TNT cast in a cylindrical container 1 inch in diameter and 2 inches in length. The container which is provided with a [illegible] contains a charge of 18.5 grams of RDX. The booster is pressed to the end of the [illegible] for detonating cord and has a recess at the other end. The [illegible] are for forming [illegible] on the ends of detonating cord in a demolition system. The mainlines, with their initiators, and the

Figure 53. Priming assembly demolition M

priming assembly M5 together with the cases as the packing for a variety of wooden or fiberboard boxes. One of these boxes MSA1 would be the most frequently used.

101. Packing

Detonators M6 are packed four to a wooden block M7. Four wooden blocks are packed in a metal container M8. Two containers M8 are packed in a wooden box MSA1.

Section IV DEMOLITION TRAINING KITS T38 AND T39

102. General

These training kits are for the instruction of personnel in the use of demolition materials. The kits are also useful for testing personnel for qualification and proficiency tests. Each kit contains all the materials necessary for training purposes. Various items, such as detonators, are omitted to prevent the kits from becoming explosive hazards. All explosive items used in training kits are inert, and the safety fuse will not burn. Inert explosive components have the same weight and appearance as live explosive components. Inerted items used in demolition training kits are

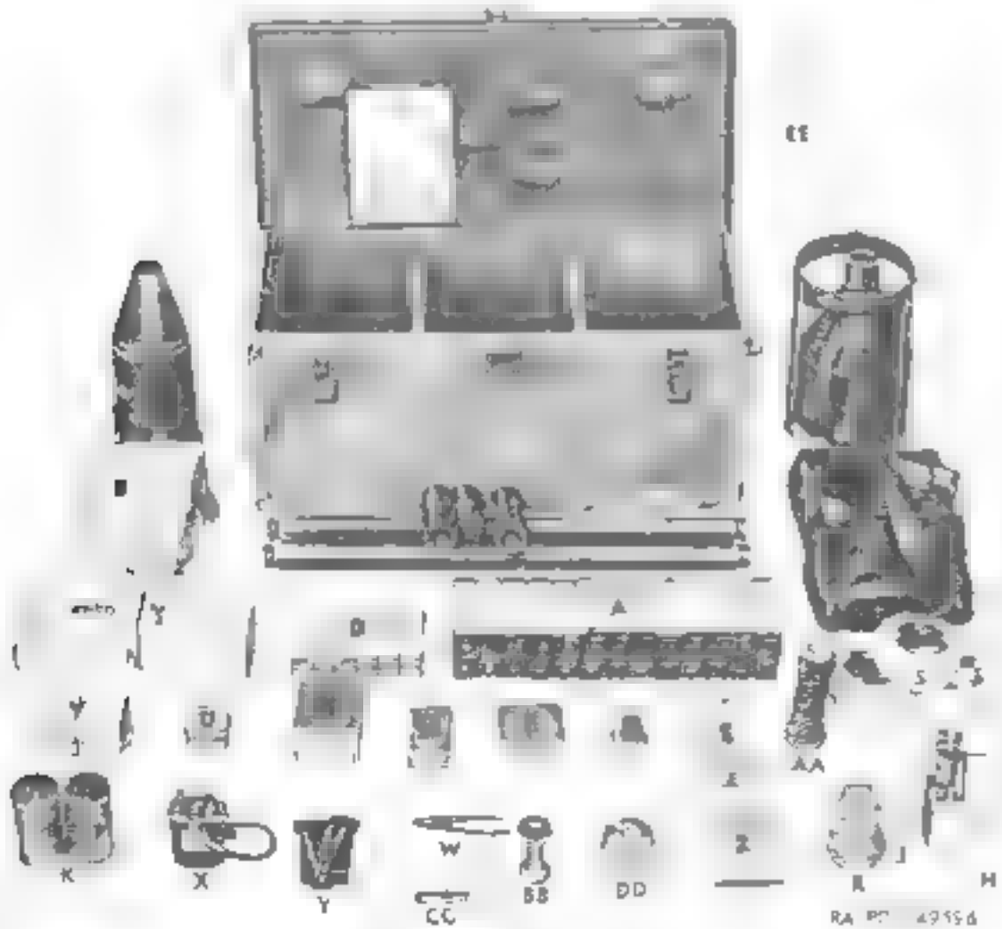


Figure 54. Demolition training kit T38

Figure 55. Demolition training kit T39 packed in plywood box

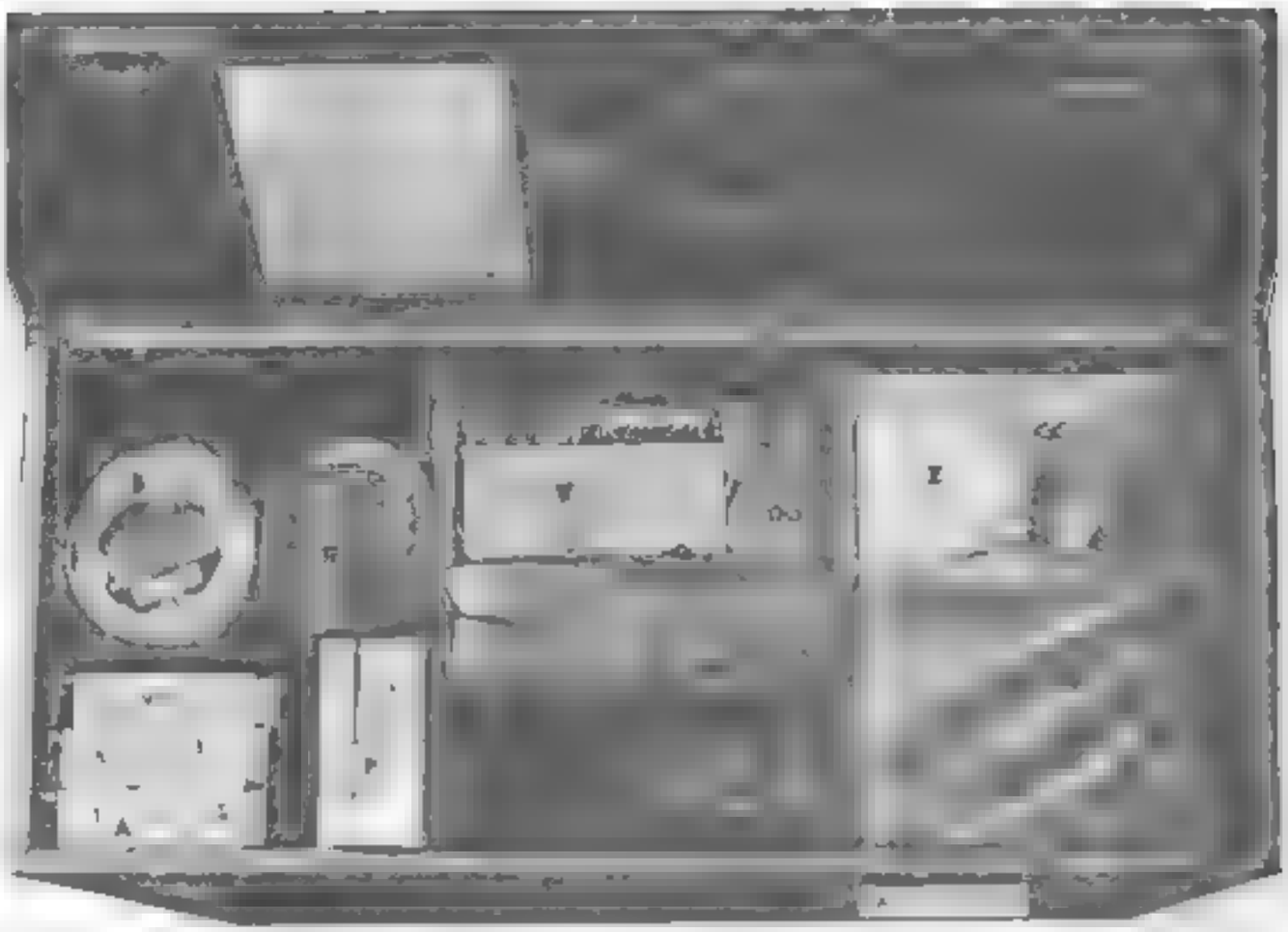


Figure 46. Demolition training kit T38 packing plan middle layer

Figure 47. Demolition training kit T38 packing plan bottom layer

to be employed is exactly the same as that for the *Prefabricated Timber Hut (Temporary)* and *precast concrete* as are the expansion joints, weathering, the details of equipment sets separately from the essential features of the building, be found in the relevant publications. Diagrammatic drawings of the main portable buildings, together with lists of the component parts of these kits, are given in this section. For descriptions of individual services installed in these kits, see paragraphs 19 through 59.

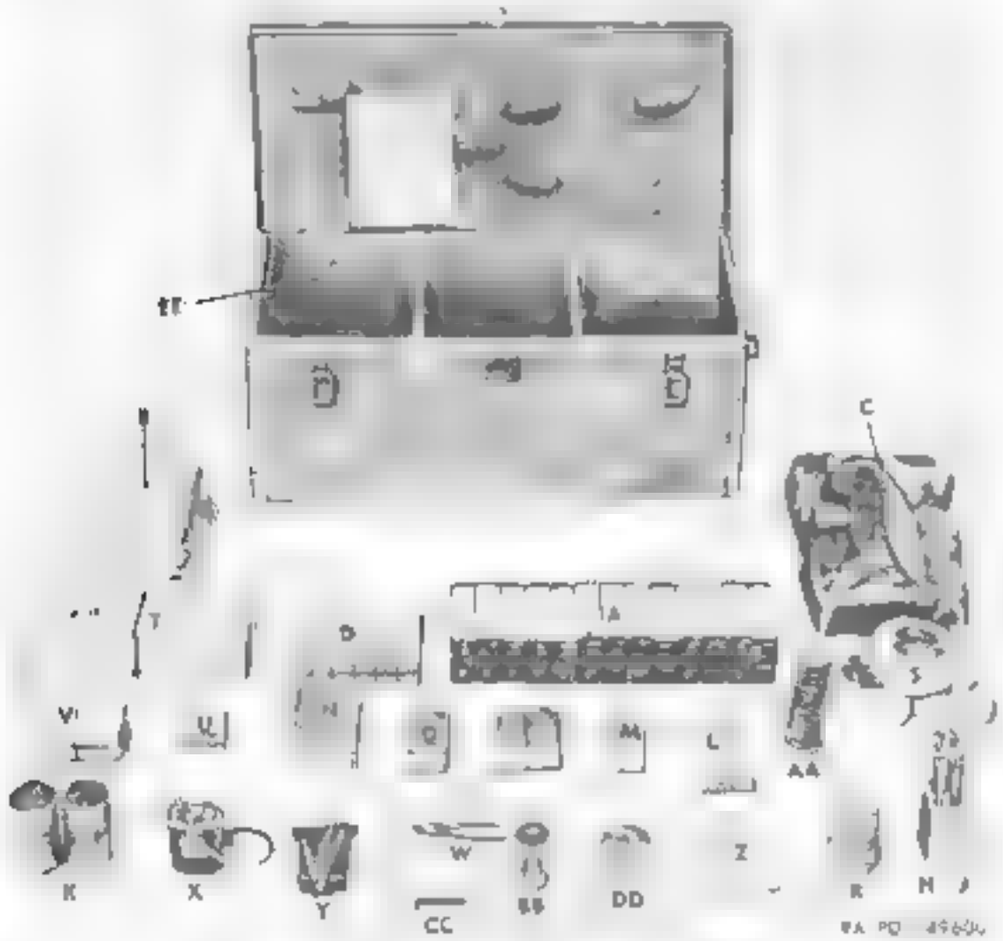


Fig. 58. Prefabricated timber hut (temporary)

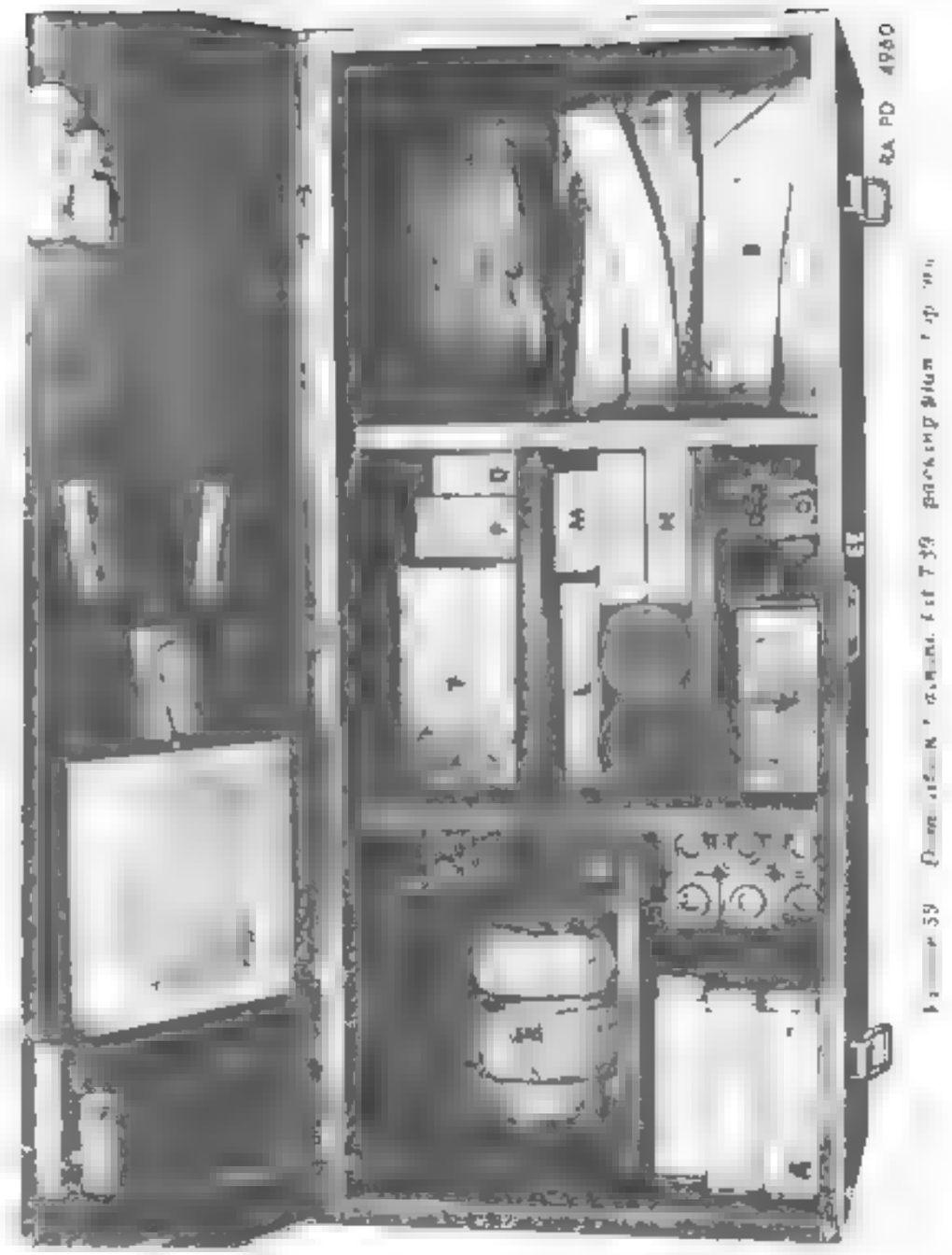
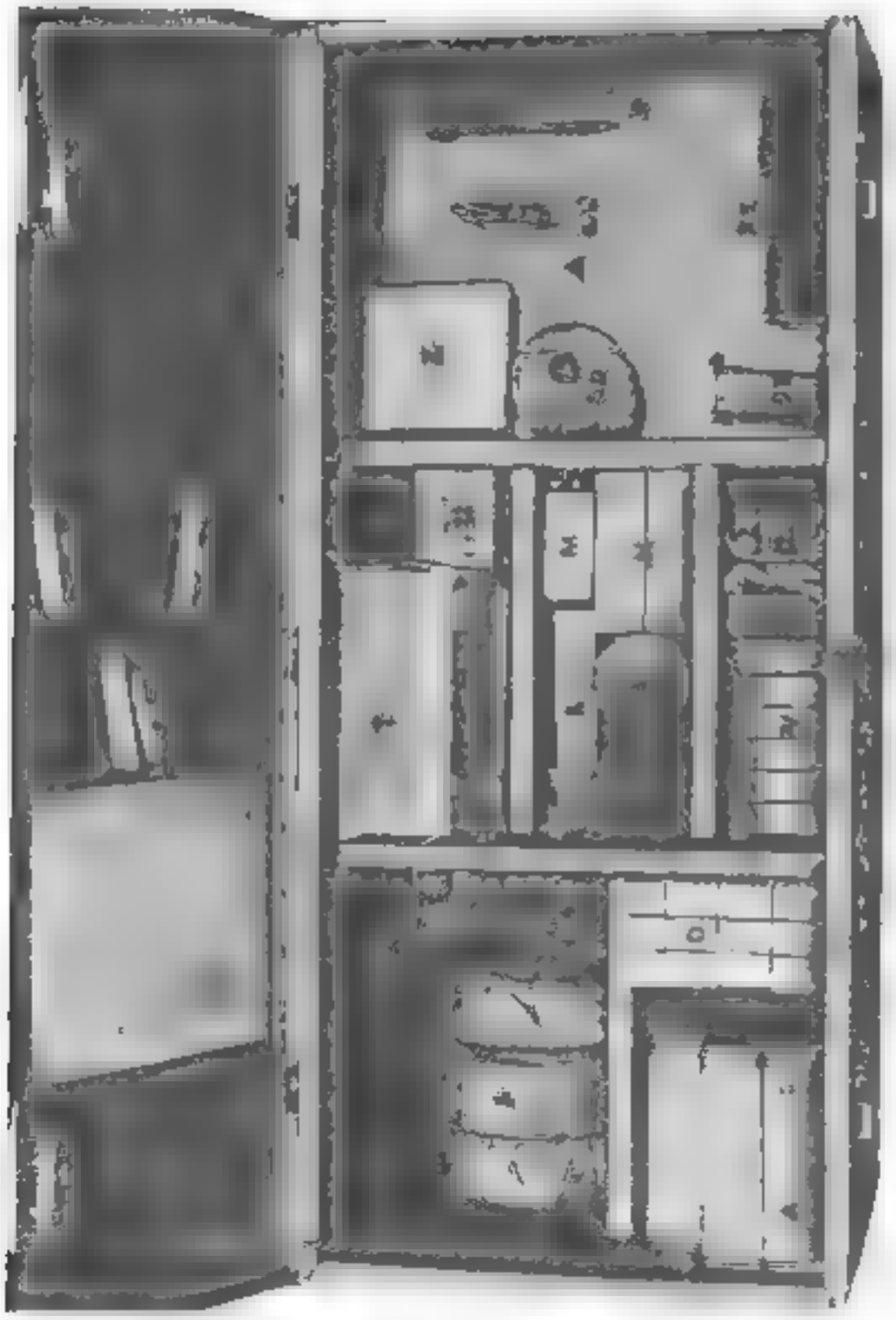


Fig. 59. Demountable framing kit (RAF)



RA PD 149602

Figure 60. Demolition training kit T39, packing plan, bottom layer.

103. Components

The training kits T3s and T39 are identical, except that kit T39 omits the following

Bangalore torpedo (E in fig 54 and 1 in list below)
Shaped charge—15 pounds (F in fig 54 and 1 in list below)
Shaped charge—40 pounds (G in fig 54 and 1 in list below)

Note. The item letters are keyed to figures 54–60.

The components of these training kits are as follows:

A	*26 EXPLOSIVE, TNT, 1 lb block, inert* Standard TNT block, inert, loaded to approximate weight
B	*8 BLOCK, demolition, chain, M1, inert* Wooden boxes containing approximate weight of 8 pounds of [illegible] blocks [illegible] M1 inert Two sets of 8 standard M3 training demolition blocks, fused [illegible] M1 packed in standard [illegible] boxes
D	[illegible]
E	*1 TORPEDO, bangalore, M1A1, inert* 1 standard nose cap, 3 standard connecting sleeves, and 3 [illegible] with [illegible] [illegible] approximate weight [illegible]
F	*1 CHARGE, shaped, 15 lb, M2A3, inert* Standard [illegible] shaped charge [illegible] approximate weight [illegible]
G	*1 CHARGE, shaped, 40 lb, M3 inert* Standard [illegible] shaped charge inert loaded [illegible] approximate weight [illegible]
H	*2 Detonator, 15-sec delay, M1 inert* Standard [illegible] detonator with inert primer and [illegible] detonator
J	*2 DETONATOR, 8-sec delay, M2 inert* Standard [illegible] detonator with inert primer and [illegible] [illegible] packed in [illegible] wooden box, which also [illegible] dates items H and J
K	*2 DETONATOR, concussion type, M1, inert* Standard [illegible] detonator [illegible] primer and detonator and wooden [illegible] packed for [illegible]
L	*[illegible] ADAPTER, priming explosive, M1A3* One box of 50 standard priming adapters
M	*[illegible] CAP, cord detonating, M1* One box of 50 standard detonating cord caps
N	*10 FIRING DEVICE, pressure type, M1, inert*
P	*10 FIRING DEVICE, pull-friction type, M2, inert*
Q	*5 FIRING DEVICE, pressure-release type, M5, inert* Items N, P, and Q are standard firing devices, with inert primers and detonators, packed 5 per box

Item letter	Item
R	*4 CORD, detonating, inert (100-ft spool).*
S	*3 FUSE, time blasting, inert (100-ft spool).* Items R and S are of inert detonating cord and time blasting fuse, respectively, simulating the standard items.
T	*100 CAP, blasting, special, electric (type II (J2 PETN)), inert.*
U	*100 CAP, blasting, tetryl, nonelectric, inert.* Items T and U are of inert standard blasting caps; item T to be packed 50 per box; item U to be packed 100 per box.
V	*50 LIGHTER, fuse, weatherproof, M2, inert.* Standard fuse lighters, with inert primers, packed 5 per box.
W	*2 CRIMPER, cap (w/fuse cutter), M2.* Standard cap crimper.
X	*1 MACHINE, blasting, 10-cap capacity (class A).* Standard cap blasting machine.
Y	*1 GALVANOMETER, blasting, complete.* Standard blasting galvanometer, complete with case and carrying strap.
Z	*2 TAPE, friction, general use, grade A, ¾-in wide, ½-lb roll.* Standard ¾-inch friction tape, in ½-pound rolls, one roll per package.
AA	*1 WIRE, firing, 2-conductor, vinyl polymer covered, 250-ft roll, No. 20 AWG, training.* Standard double conductor firing wire, in 250-foot rolls.
BB	*1 WIRE, annunciator, single-conductor, cotton covered, 50-ft roll, No. 20 AWG, training.* Standard commercial, single conductor, cotton covered annunciator wire, in 50-foot rolls.
CC	*1 KNIFE, pocket, general purpose, 74–K–65 (Quartermaster Corps.)* Standard general purpose pocket knife.
DD	*2 TWINE, hemp, No. 18, ¼-oz ball.* Commercial No. 18 hemp twine.
EE	*1 CHEST, demolition squad.* Standard demolition squad chest, less contents.

Note. All inert or dummy items are stamped "INERT" or "DUMMY," as may be appropriate, in large black block letters on the item or, if its size does not permit, on its container. Detonators (caps) are perforated with at least two small holes in the side wall, to prevent confusion with loaded items.

CHAPTER 5

MINE-CLEARING DEVICES

Section I. CABLE, DETONATING, MINE-CLEARING, ANTIPERSONNEL, M1

104. General

This demolition item is a flexible linear charge used to clear narrow lanes in antipersonnel mine fields (fig. 61).

105. Description

a. Detonating Cable.

(1) The nylon-covered detonating cable is 170 feet long and about 1 inch in diameter, weighs 63 pounds, and contains 46 pounds of oil-soaked PETN. This charge consists of 19 strands of *special* detonating cord, each strand containing approximately 100 grains of PETN per foot. This contrasts with the 40 grains per foot contained in regular detonating cord, which should *not* be used as a substitute.

(2) The cable is coiled around a cone in a carrying case (fig. 62). The cone is removed (par. 107*d*) from the case before the unit is fired. One end of the cable is anchored to the ground and has a sleeve containing a booster charge and a threaded cap well for inserting a 15-second-delay detonator. This end also has a braided-wire cable grip with two 8-inch wire loops for anchoring the cable to a 13-inch oak tent stake driven into the ground.

b. Launcher. The launcher is a folding stand made of small aluminum angles. When set up on level ground with the propulsion unit (jato) on the launcher, the angle of elevation is 38°.

c. Other Equipment. A fuse lighter M2 is provided for igniting the propulsion unit, a 15-second-delay detonator for exploding the cable, and a 13-inch oak tent stake for anchoring one end of the cable.

d. Carrying Case. The entire assembly is contained in a cylindrical aluminum can, 16½ inches in diameter, 20 inches long, and weighing 92 pounds. Both ends of the can have removable lids with carrying handles. The joints between the lids and the case are waterproofed. The loaded case is designed for transportation to the firing point by two men.

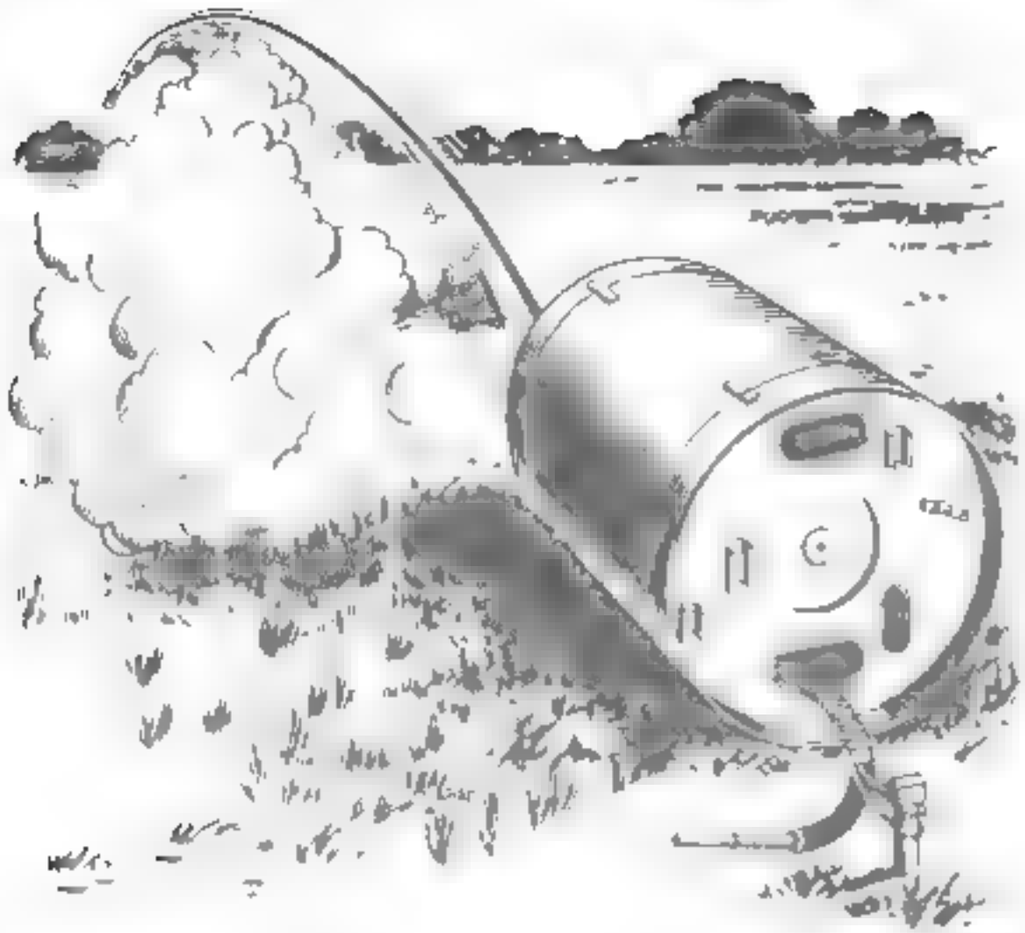


Figure 61. Jet-propelled unit for launching a detonating cable across a minefield

RA PD 16948

Figure 62. Cable detonating mine-clearing antipersonnel M1 carrying case

106. Functioning

The cable is projected across the mine field by a jet propulsion unit from a launcher, where it is exploded by a 15-second-delay detonator. Grass, leaves, other light vegetation and some soil are blown aside in a lane about 8 feet wide. More soil is blasted aside when the ground is moist and soft than when dry and hard. Camouflaged antipersonnel mines and those near the surface in the 8-foot lane normally are exposed.

a. Mines. If the cable is less than 6 inches off the ground, pressure-type antipersonnel mines with the pressure surface directly under the cable are detonated or destroyed. Pressure-type mines within 5 feet of the cable may be affected, depending on the particular mine installation. *Mines not displaced by the cable may become extremely sensitive.*

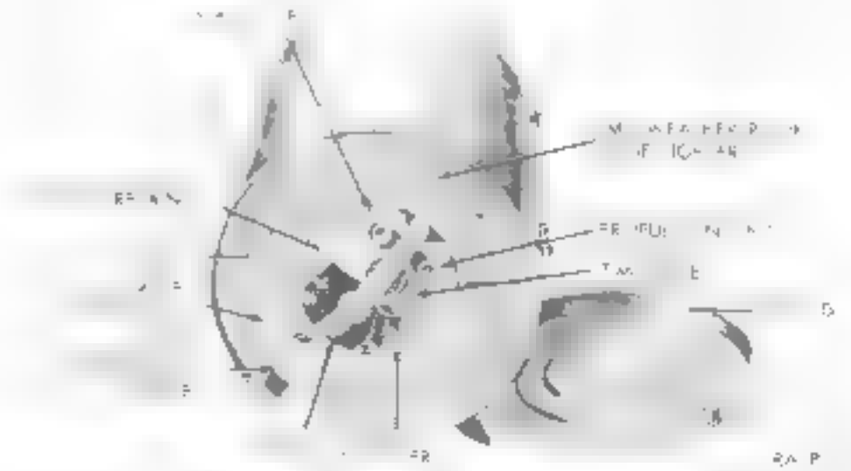
b. Trip Wires. The detonation of the cable across trip wires detonates the mines to which they are connected.

107. Preparation for Use

Proceed as follows to set up and bring the cable assembly into action through the following steps:

a. Two men carry the case assembly about 10 feet from the mine field and set it down in a location where each may take over at the prone position when the cable is detonated. They then carry the case forward to the mine field, placing the case on the ground so that the white letter T (top) is crossed on the end faces the direction in which the cable is to be launched.

b. One man at the front removes the top (1, fig. 63), unbuckles the strap holding the jet propulsion unit and retainer in place, and removes the retainer. He then takes the jet propulsion unit and folded launcher



RA PD 16944

Figure 63. Cable detonating mine-clearing antipersonnel M1 top half of case removed

out of the cone and sets [illegible] the launcher on level ground about 5 feet ahead of the case.

c. Simultaneously, the man at the rear removes the bottom lid (fig. 64) from the carrying case and unscrews the wing nut holding the cone in the case.

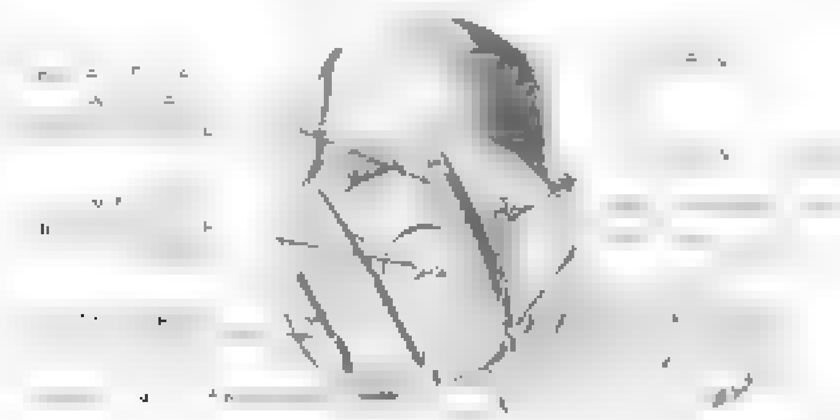


Figure 64. Cable, detonating, mine-clearing, antipersonnel, M1—bottom lid of case removed.

d. Then the case is placed in an upright position [illegible] the cone carefully [illegible] and the case replaced on its side. The arrangement of components in the case is shown in figure 65.

e. The man at the front of the case places the jet propulsion unit on the launcher, so the rear nozzle [illegible] rests against the launcher front crossbar. He pulls about six inches of [illegible] out of the case. He then takes the fuse lighter M2 off [illegible] and removes the cardboard protective cover and rubber plug from the fuse lighter. He cuts about 4 inches from the end of the waterproof [illegible]

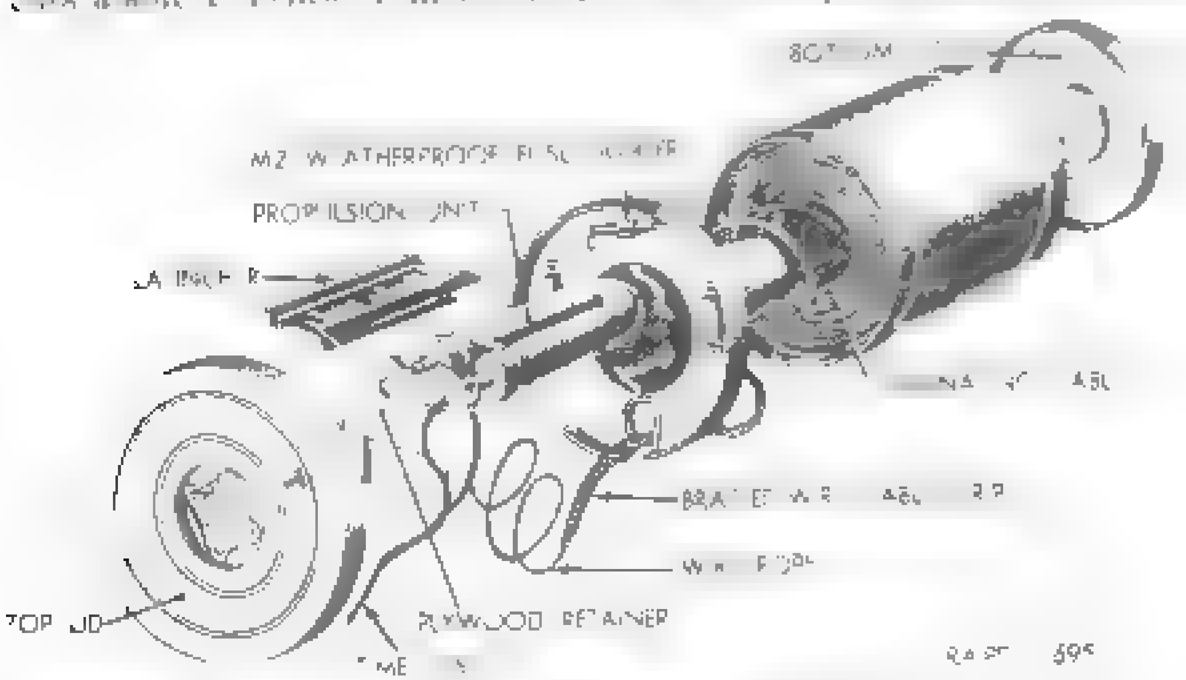


Figure 65. Cable, detonating, mine-clearing, antipersonnel, M1—arrangement of components in case.

the fuse projecting from the nozzle to expose the powder train. Making sure the sealing material around the end of the fuse lighter does not fill the end of the fuse, he pushes the end of the fuse into the fuse lighter as far as possible and withdraws it slightly, so the prongs of the fuse retainer inside the lighter fasten securely to the fuse.

f. Simultaneously, the man at the rear of the case removes the wood stake from the case, drives it into the ground about 6 inches behind the case [illegible] and places the wire loops over the stake. He then removes the cap protector from the 15-second delay detonator and screws the detonator into the cap well (fig. 64) in the rear end of the cable.

g. The man at the rear is the first man to take cover, which he does in a prone position at a predetermined location about 100 feet to the rear. The cable is now ready for firing (fig. 66). The second man, the man at the front, [illegible] the fuse lighter [illegible] the fuse [illegible] the jet propulsion unit and 4 to 7 seconds *later* the same man pulls the [illegible] detonator safety pin, then pulls the ring [illegible] the rear [illegible] of the detonator. [illegible]

h. When the fuse ignites the jet propulsion unit propellant, [illegible] personnel must take care to avoid being hit by fragments.

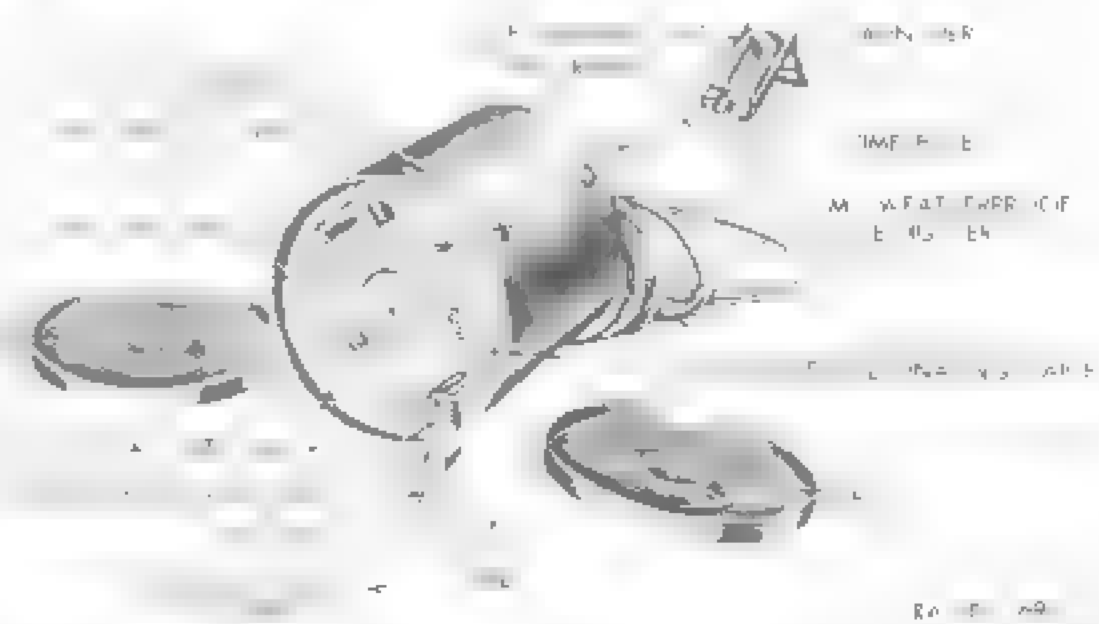


Figure 66. Cable, detonating, mine-clearing, antipersonnel, M1—ready for firing.

108. Packing

The item is issued complete with detonating cable, jet propulsion unit, launcher, firing equipment, and waterproof aluminum carrying case (fig. 62) painted olive drab. Both ends of the case have removable lids with carrying handles. Each case is packed in a wooden box.

Section II. SNAKE, DEMOLITION, M2, M2A1, AND M3

109. General

The demolition snake M3, which is described in this section, is the standard demolition snake. For essential differences between the snakes M3 and the limited standard snakes M2 and M2A1 see paragraph 119. Tactical use of demolition snakes and their effect on mine fields are described in FM 5–32. The use of demolition snakes for the demolition of obstacles other than mine fields is described in TM 5–220.

110. Description of Demolition Snake M3 Parts

a. General. This snake (fig. 67) consists of two parallel linear explosive charges encased between corrugated aluminum plates, bolted together to form a rigid assembly, which can be towed or pushed by a light or medium tank. It is flexible in vertical plane to permit it to pass over rough ground and rigid enough in horizontal plane so it will maintain a relatively true course when being pushed. The assembled snake, shown in cross section in figure 68, is 14 inches wide, 5 inches high, and 400 feet long. It weighs approximately 9,000 pounds, including 4,500 pounds of explosives. For information pertaining to training of crews for assembly of snake, see FM 5–32 and/or TM 5–220. A list of parts issued with each snake is given in table VII.

Table VII. Accessories, Tools, and Component Parts for Construction of 400-Foot Demolition Snake M3

Item	Quantity
Snake parts:	
Corrugated aluminum body plate	200
1⅛-in. bolt, 3 in. long	210
Special washer	420
1⅛-in. square nut	210
Nose	1
Nose adapter and towing hook	1
Nose retainer	1
Tamping bag	40
Pushing hook	1
Fuze shield	2
Tail ramp	1
Explosives:	
Explosive charge for demolition snake M3	128
Bullet impact fuze M1	2

Table VII. Accessories, Tools, and Component Parts for Construction of 400-Foot Demolition Snake M3—Continued

Item	Quantity
Tank accessories:	
Pulley support post with pulley	5
Rope guide ring with pulley	2
Rope guide ring	1
⅜-in. sash cord (ft)	15
⅛-in. aircraft cable (ft)	33
Cable clamp	1
Periscope fitting (for medium tank)	1
Direct-vision port fitting (for light tank)	1
Crank	1
Towing yoke assembly	1
⅝-in. pushing chain, 5½ ft long	1
Tools:	
Structural wrench	6
Socket-wrench assembly	2

b. Body Plates. The corrugated aluminum plates (fig. 69) form the body of the demolition snake. Top and bottom plates are identical. Each plate is 9 feet long and 14 inches wide, about one-eighth inch thick, and weighs 16 pounds. Five holes are spaced 2 feet apart along the center of the plate, starting 6 inches from either end. The plates are painted olive drab, with a patch of white paint around each bolt hole for ease in locating holes in night assembly.

c. Bolts, Washers, and Nuts (fig. 70). Eleven-sixteenths x three steel bolts, washers, and nuts are used to fasten the corrugated plates together. The washers are specially shaped to assure a uniform bearing surface. Nuts and bolt heads are 1 inch square.

d. Nose Adapter and Towing Hook (fig. 71). The nose adapter connects the demolition snake to the nose. It is fitted between the body plates at the forward end of the snake and is secured by two bolts, which fasten the plates together. The towing hook is an integral part of the adapter, being welded to its upper side as shown. A bumper ring around the adapter just forward of the towing hook prevents the nose from sliding too far back over the adapter.

e. Nose and Nose Retainer (fig. 72). The hollow pear-shaped aluminum nose fits over the nose adapter. It is lashed to the adapter with the ⅛-inch aircraft cable. This cable, which is looped through the slot in the towing hook, is passed through the 3-inch hole in the tapered part of the nose, then through the loop in the nose retainer, and the ends of the cable joined with a wire clip. The nose is free to swivel slightly in any direction and aids in guiding the forward end of the demolition snake over or around obstructions, such as trees or boulders.

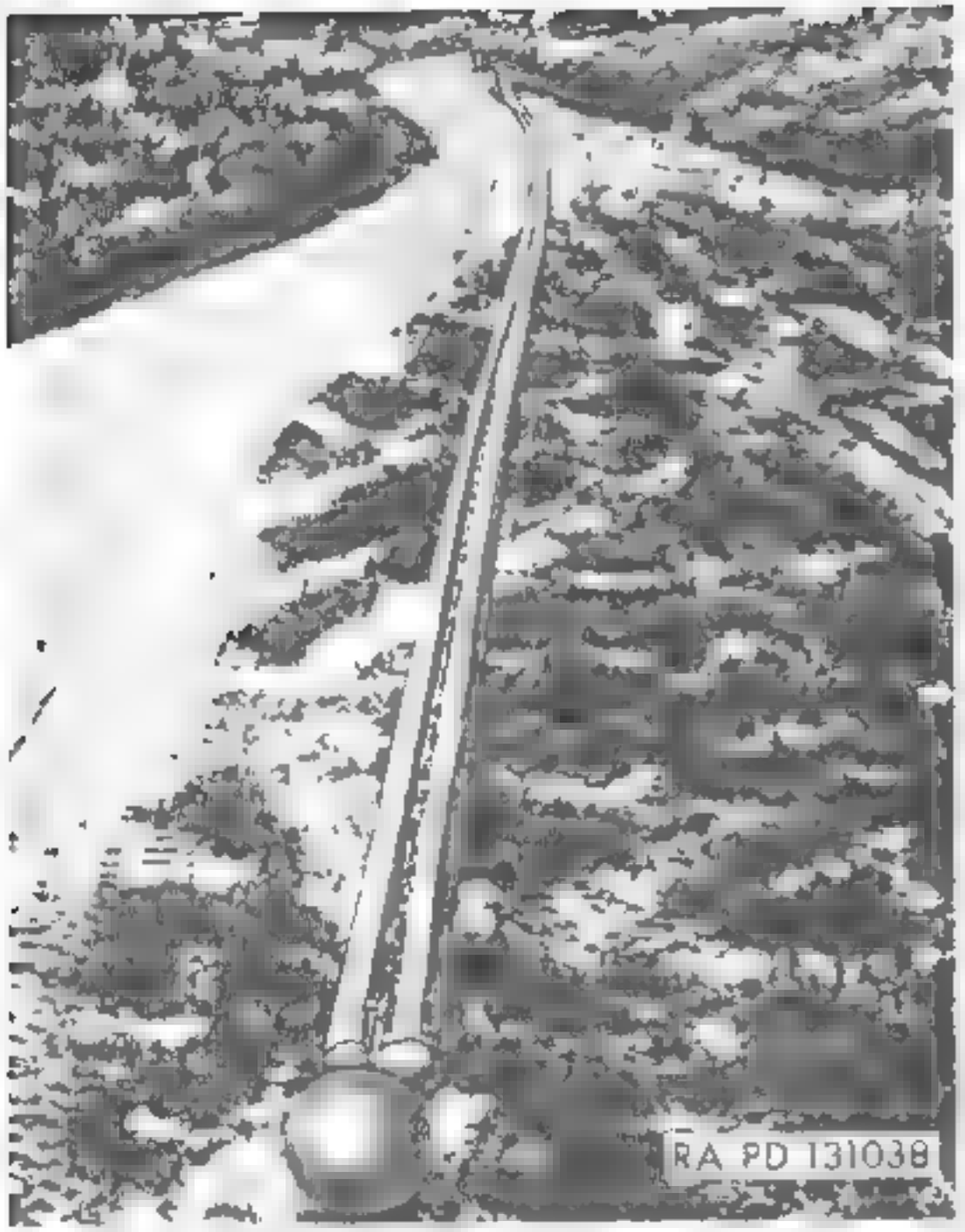


Figure 67 Medium tank pushing demolition snake M3

f Pushing Hook (fig. 71). [illegible] hook assembly consists of a hook welded to a steel bar, which has four bolt holes for attachment to the demolition snake. A flat steel plate welded to the top of the hook bears against the body of the tank during pushing operations. The assembly is attached to the snake between the fourth and fifth sections from the rear and the second section from the rear.

g Bolts, Lock Washers, and Nuts (fig. 70).

(1) *Fuze, blasting, nonelectric, M1A1* (fig. 72). Used with demolition snakes M2A1 and M3. It consists of a target plate of [illegible] steel, a [illegible] body, which contains a detonator and two shaped charge boosters. The target plate [illegible], which is

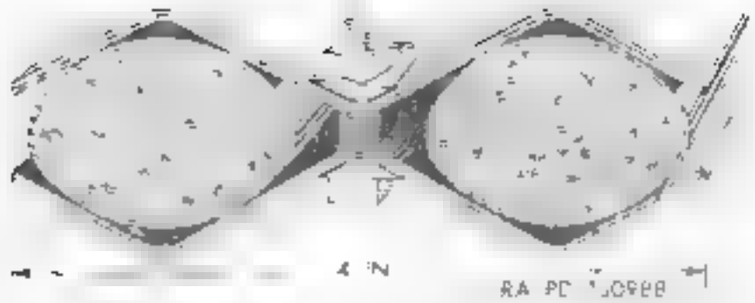


Figure 68 Cross-section of demolition snake M3 loaded with explosive charges

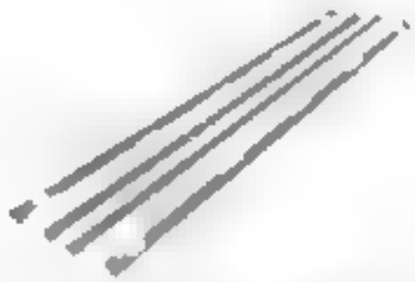


Figure 69 Corrugated aluminum plates, demolition snake M3

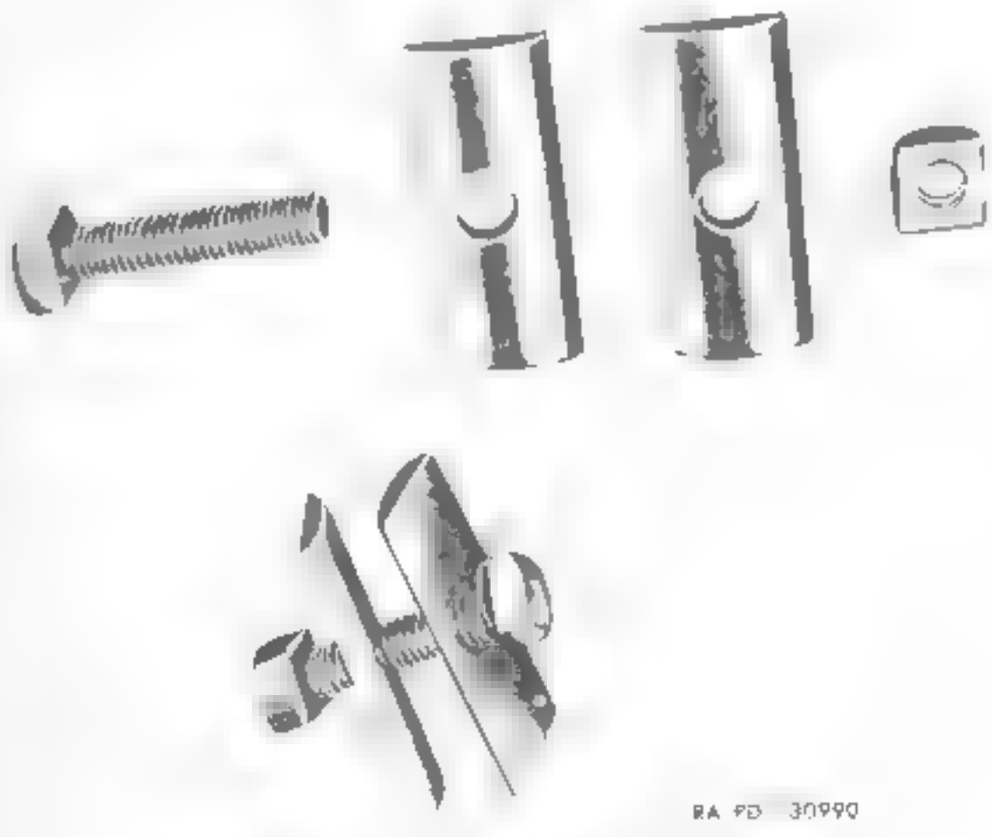


Figure 70 Bolts, washers, and nuts for demolition snake M3

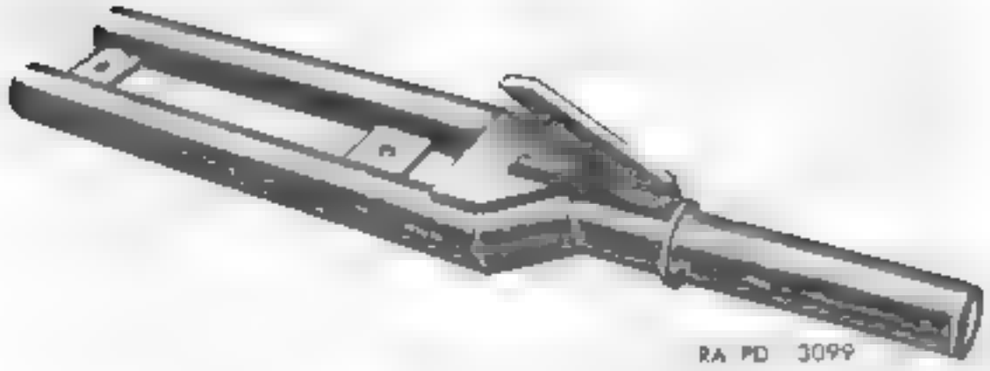


Figure 71 Nose adapter and towing hook, demolition snake M3

restrained by a shear pin and safety fork. The safety fork must be removed before the fuze can be operated. In placing the fuze, care must be exercised to assure the serrated ap. sure the effect of the two shaped boosters is directed downward perpendicular to the two flat edges. Two of these fuzes are furnished with each snake M2A1 and M3. The fuze M1 (pg. 74) is similar to the M1A1 except for water-resistant operating features. The fuzes are packed one per interior lv sealed metal and wooden box.

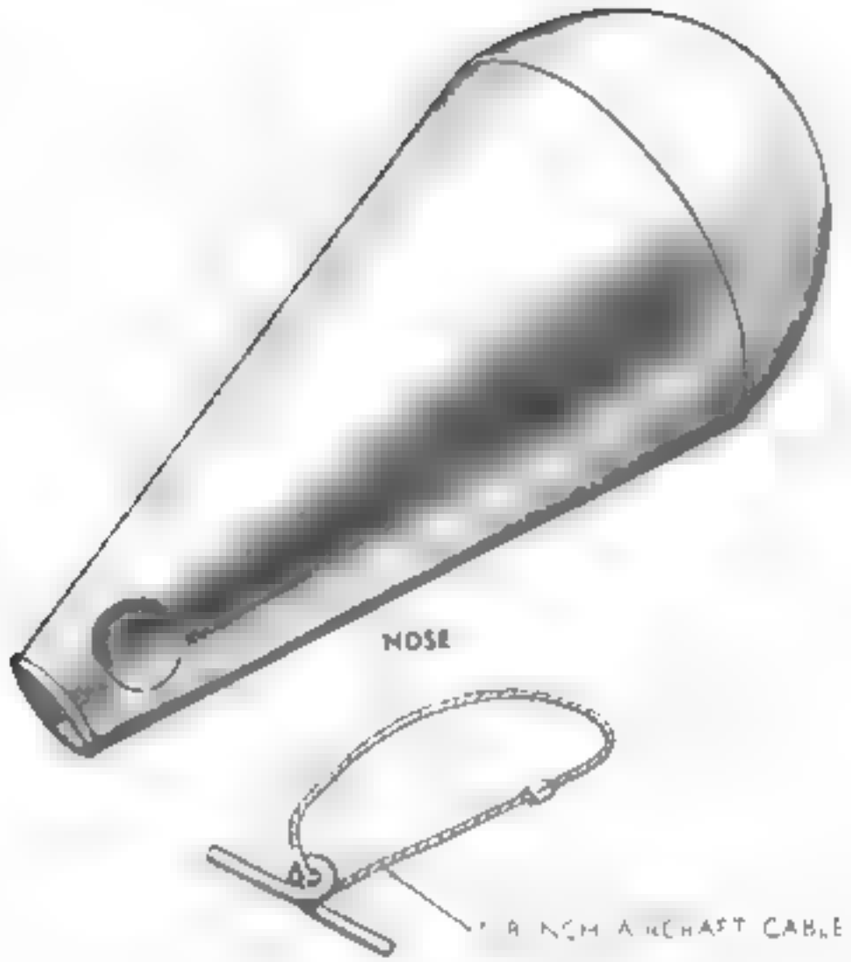
(2) *Fuze shield.* The fuze shield (figs. 70 and 77) serves as a bracket for mounting the fuze and protects it from low-velocity fragments. To prevent premature detonation by fragments, the fuze

fire. A cotter pin chained to the shield is inserted in a hole in the shield to keep the fuze in position. In loading the sections of the demolition snake, it is necessary that the TNT ends of the cartridges be oriented correctly with the body of the fuze. Arrows are stamped on a portion of the cartridge case to indicate

b Explosives.

(1) *Explosive charges.* Five pounds of cast explosive charges (figs. 70 and 72) are used with the demolition snake M3. They are 3-inch diameter cylinders weighing 1 pound each and weighing approximately 5 pounds of explosive. The body of the explosive charge is cast around a 6-inch booster charge of pressed TNT at each end. One end contains a cap well to receive a blasting cap, when the charges are used individually for general demolition work. One hundred twenty-eight charges are loaded in 25 feet of 4-inch-diameter snake giving an explosive weight of 1.4 pounds per foot.

(2) *Boosted tetrytol charges.* Tetrytol shaped charges cased in tubes may be used as alternate explosive charges when demo-



NOSE RETAINER

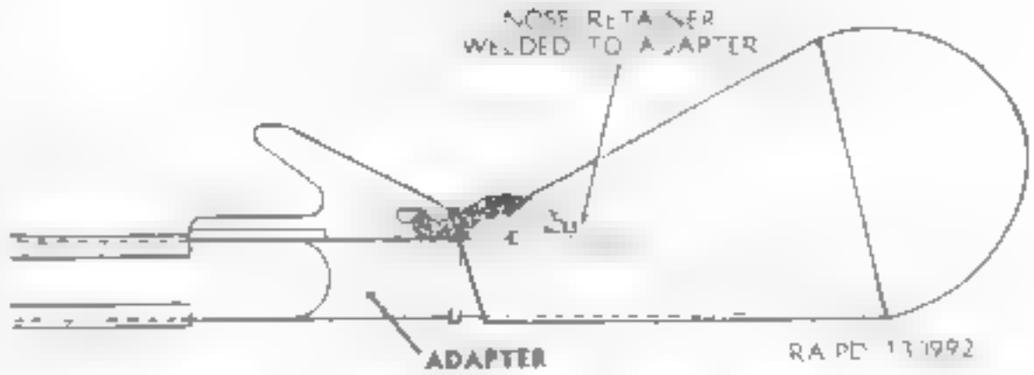


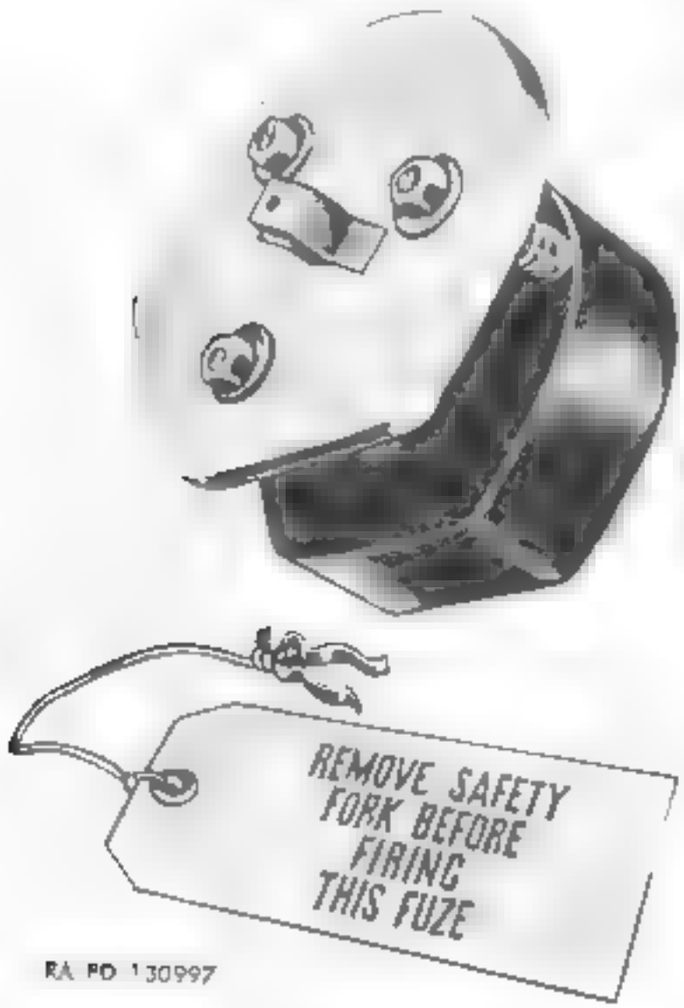
Figure 72 Nose and retainer, demolition snake M3

RA PD 30993

Figure 73 Pushing hook, demolition snake M3.

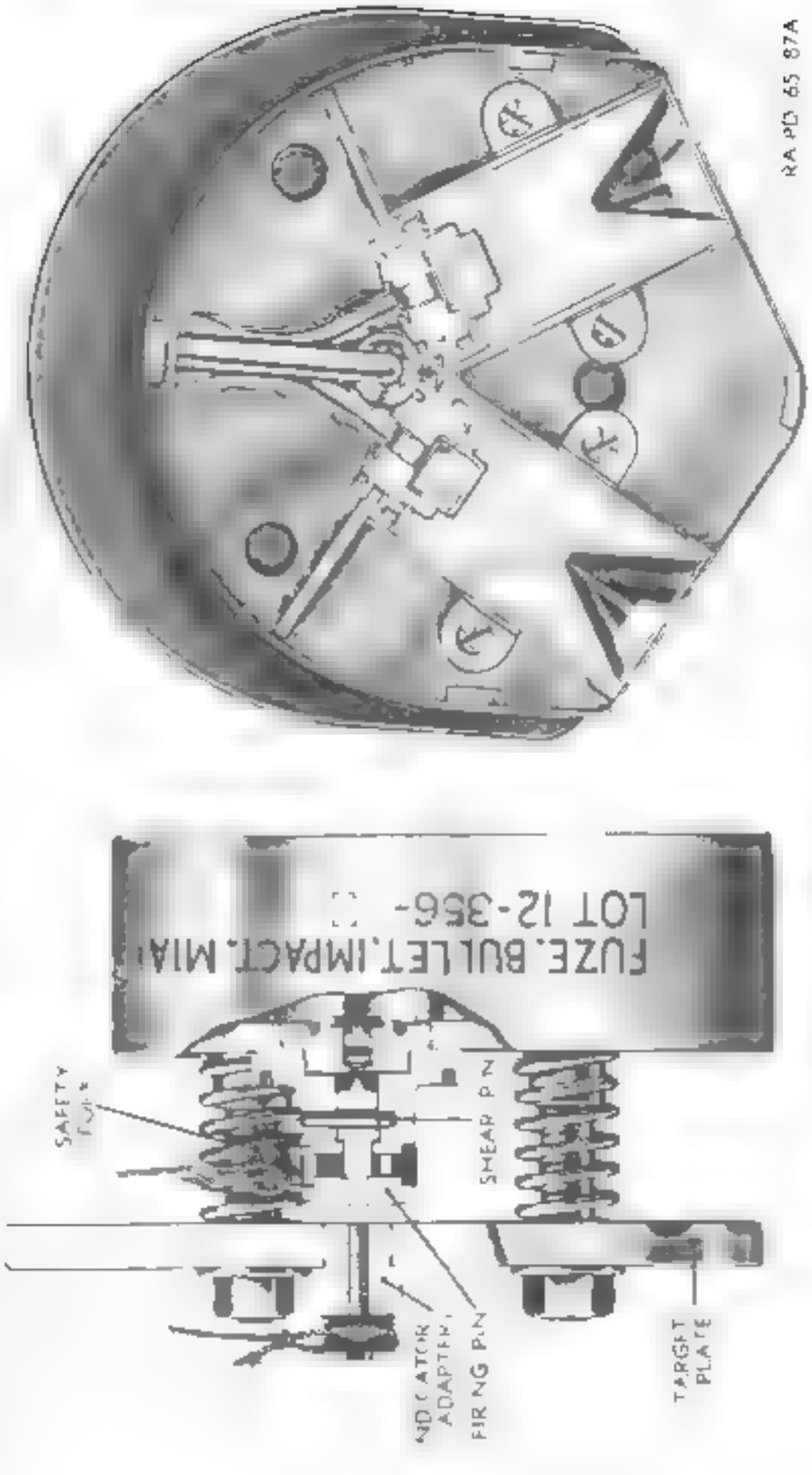
lition snake charges are not available or when tubes of exploded demolition snakes are salvaged to build new snakes. A bundle of four bangalore charges taped together is used in each corrugator of the snake. Two eight-charge bangalore charges give an explosive weight of 1.64 pounds per foot.

d. Tail Ramp (fig. 81). The tail ramp is a small hinged steel skid, which fastens to the rear of the demolition snake. The bangalore bursters in the snake charges are staggered to prevent the pushing gear from forcing the end of the snake while engaging the pushing hook.



RA PD 130997

Figure 74 Fuze, bullet impact, M1



RA PD 65 87A

Figure 75 Fuze, bullet impact, M1A1, and adapter.

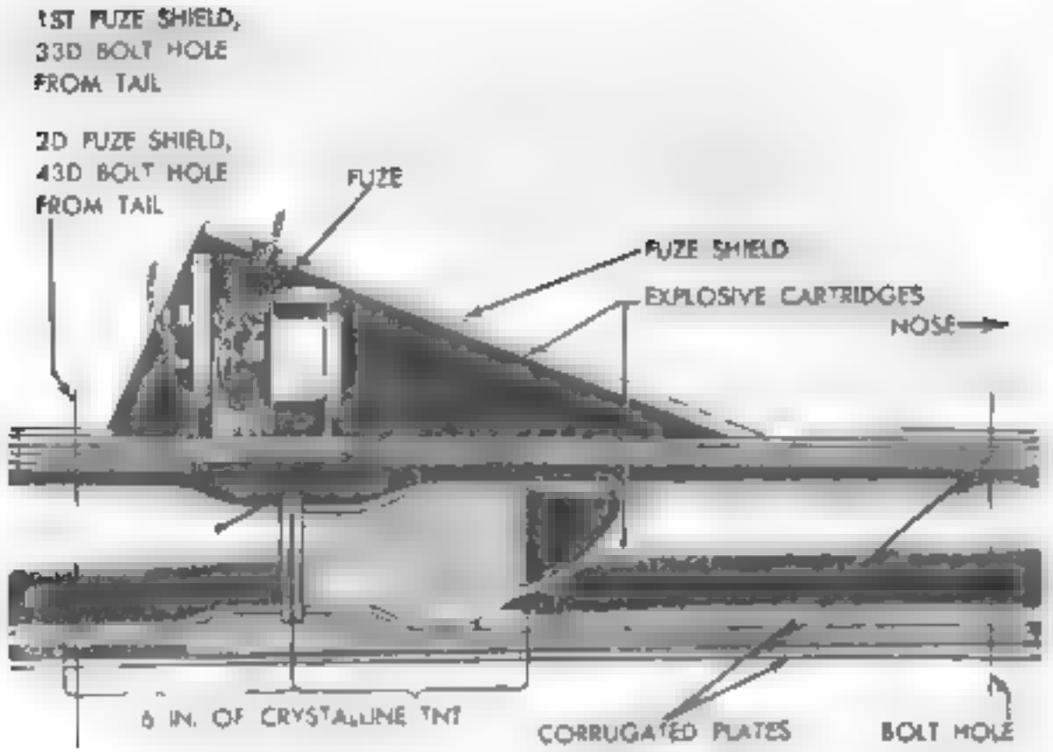


Figure 76. Longitudinal section of demolition snake M3 of two

Figure 77. Tamping bag. Burlap bags filled with earth are used for tamping. Stones and similar materials for tamping are furnished when available. Brushwood is used to prevent the charges from shifting. The ends are folded over and the bags are placed in both ends of the snake. When available, metal containers filled with earth are satisfactory for tamping.

111 Tank Accessories

g. 83

a. Pushing and Towing Devices.

1) *Pushing beam.* A 12-foot length of 3-inch steel pipe, fastened to the tank's front towing clevises, is used to push the demo-

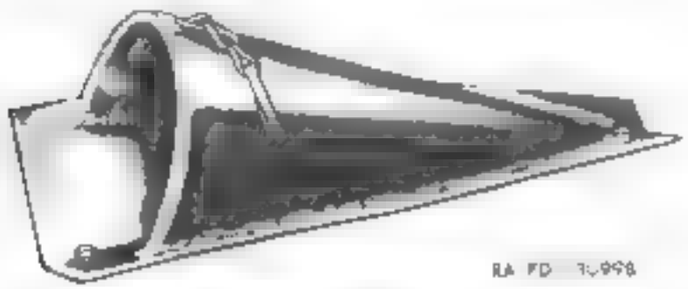


Figure 77. Fuze shield, demolition snake M3

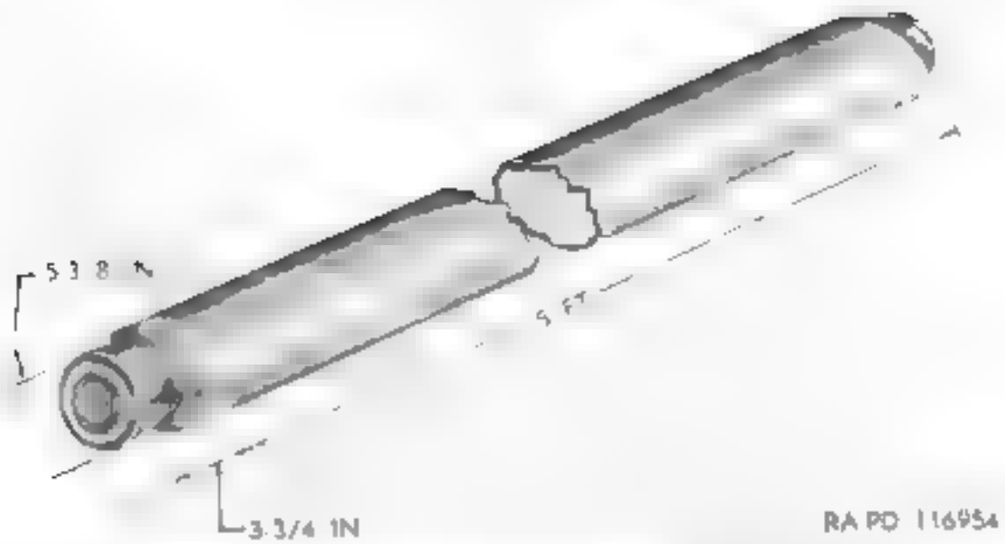


Figure 78. Charge for snake demolition M3A1 and M3

snake. A length of rope is secured to the rear end of the tank for towing or lowering the charge. Two towing rods are used to tow the charge to the snake and to place it in the tank. It consists of two steel square bars joined to the rear towing lugs of the tank, a semicircular yoke to fit the curvature of the

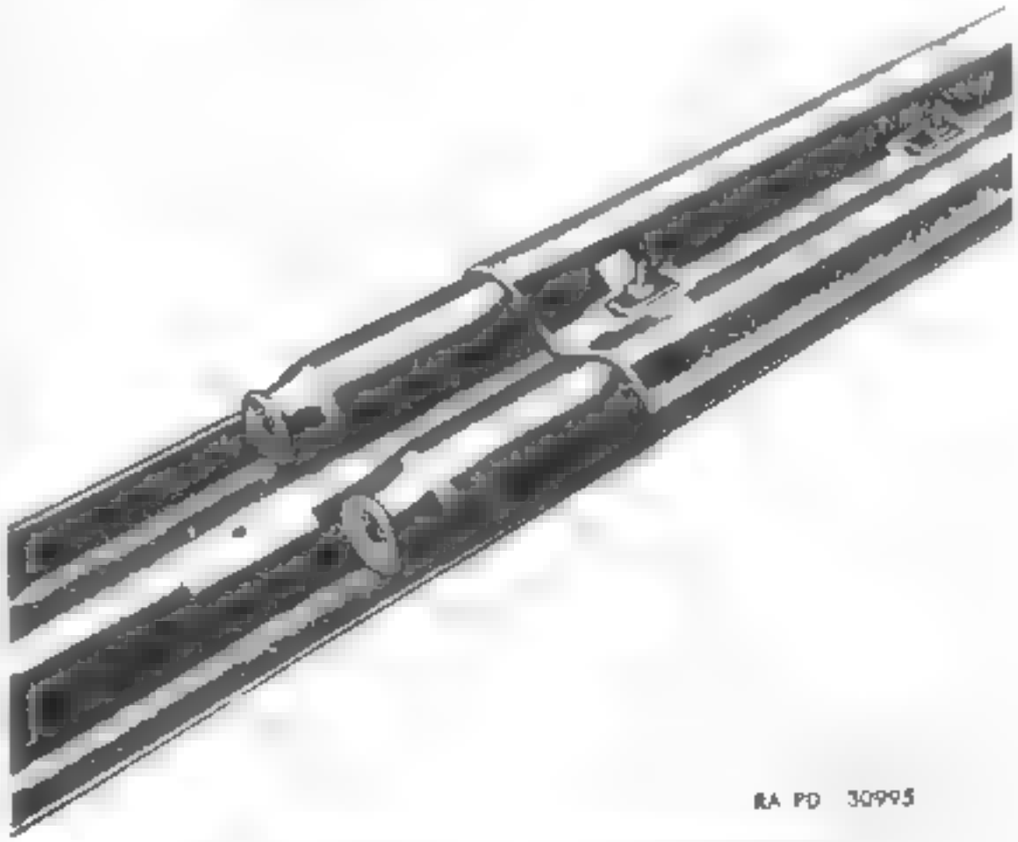
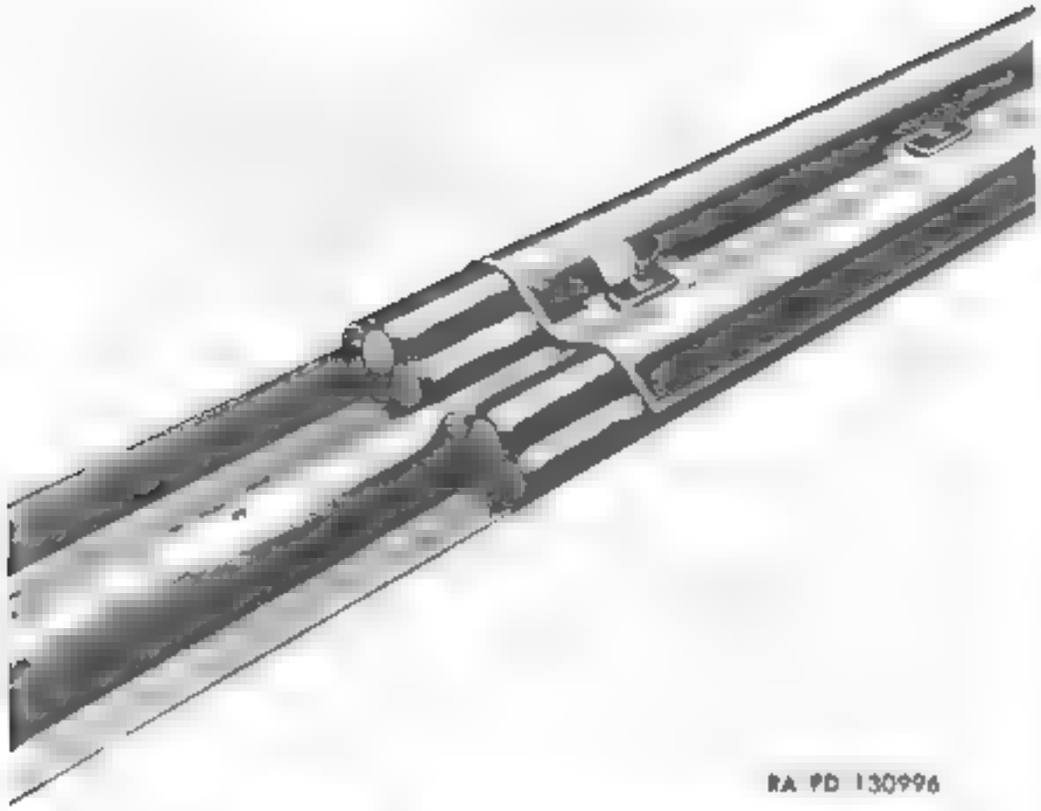


Figure 79. Demolition snake M3 loaded with explosive charges

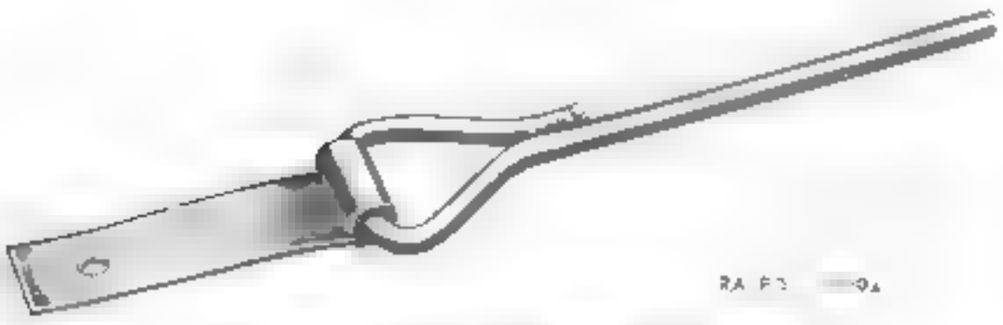


RA PD 130996

Figure 80 Demolition snake M4 coupled with bangalore torpedoes

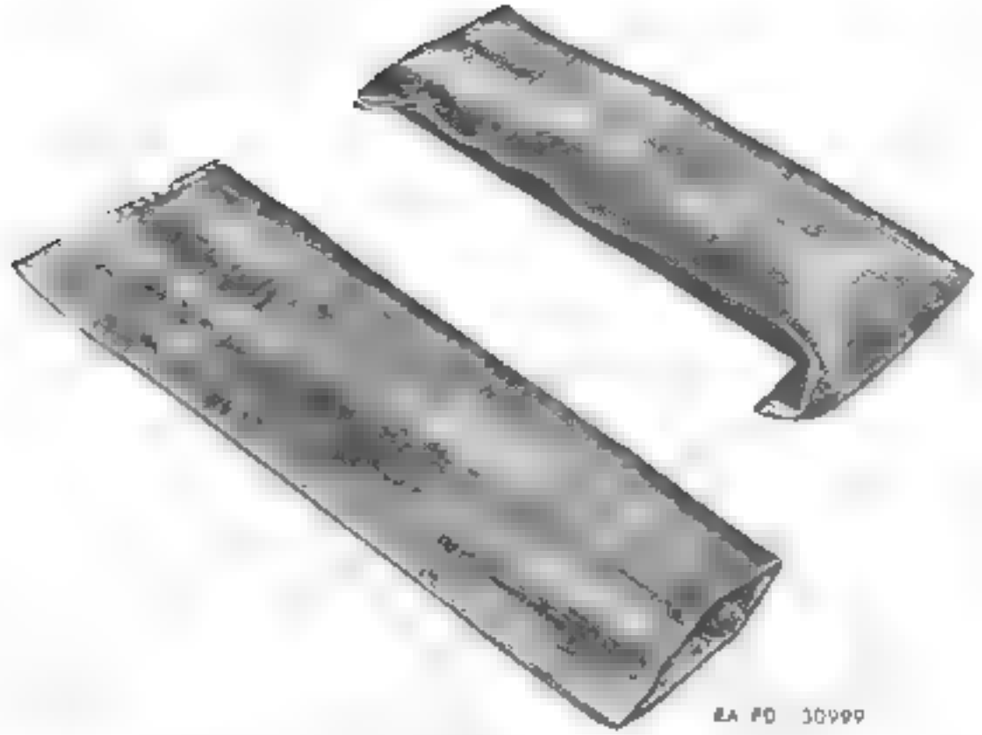
bars, which can be used to move the snake for long distances, to the rope for pulling the assembly and the towing shackle to the towing tank to which the snake absorber will be secured by the towing tank will be clear of the snake

b) *Packing and cable.* A length of cable is packed in the centre of the spring to which the top angle iron of the snake through a series of pulleys secured to the tank and attached to the tank at the bow gunnel seat. It is used to raise and lower the towing yoke assembly



RA PD [illegible]

Figure 8 Tank pump [illegible] snake M3



RA PD 30999

Figure 82 Tamping bags demonstration snake M4

c) *Pressure and pumping.* The pressure for filling the bags is obtained from the tank. A length of the pressure line is fitted to the bow gunnel outlet of the pressure fitting. A length of the pressure line is fitted to the bow gunnel outlet of the pressure fitting.

b Wrecking bars. Two of the snake wrecking bars are supplied for use in demolition snake. The tapered ends are used as in the normal manner.

c Additional Equipment. The following equipment is not issued with the demolition snake, but is required for its construction:

2 heavy wrecking bars, to assist in moving or lifting sections of snake.

4 mallets and ledges, to open explosive packing boxes.

1 shovel, to fill tamping bags.

1 2½ ton or larger truck with a [illegible] truck with a [illegible] to tow snake backward as it is lowered.

4 drift pins, ½" or ¾" inch in diameter to assemble bolting assembly.

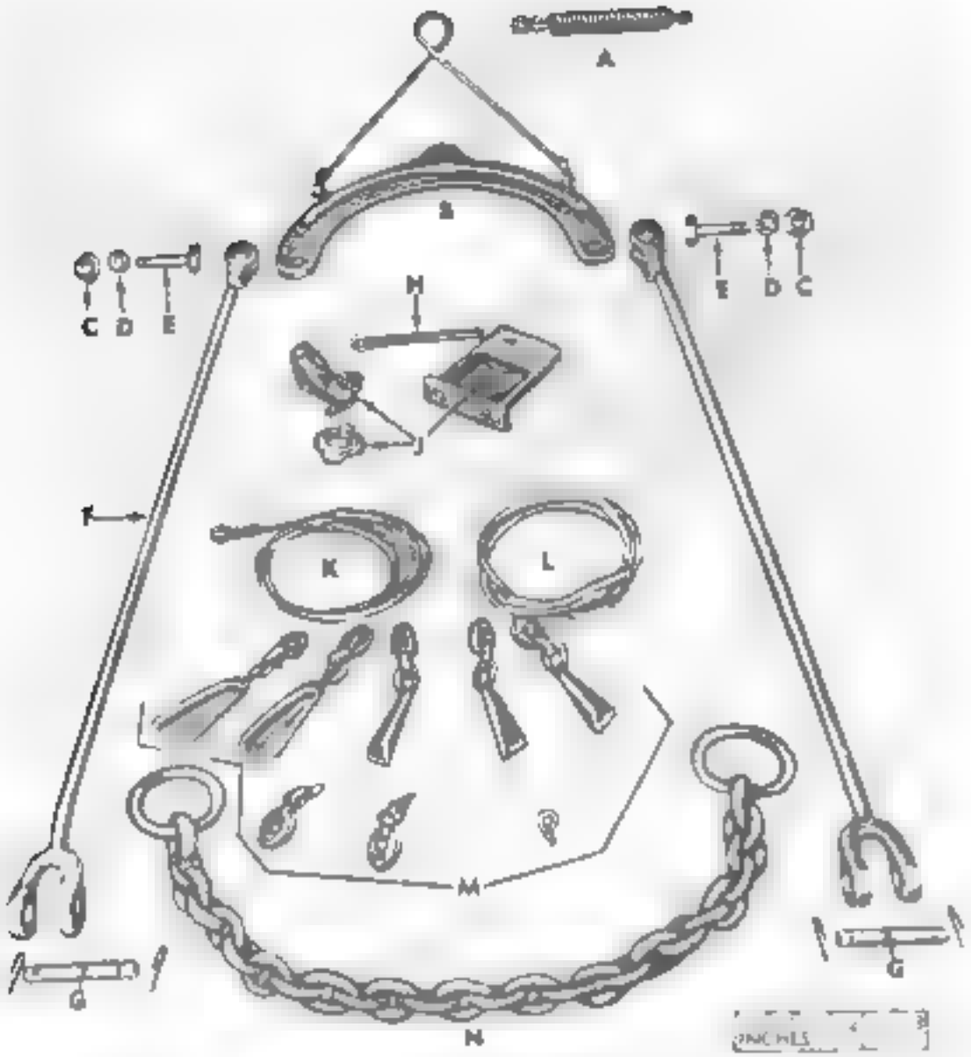


Figure 83. Tank accessories, demolition snake M

112. Assembly of Demolition Snake

Tools and Personnel. Personnel must be trained to give a trained assembler the demolition snake effect at the minimum risk of handling large explosive charges. Personnel must realize that only an almost direct hit with artillery shell will detonate the snake. High-explosive 105-mm projectiles must land within 1 yard of the snake to detonate it. Small arms fire striking the crystalline TNT ends of the explosive charges of the snake may detonate it. The snake should be assembled several times under good weather

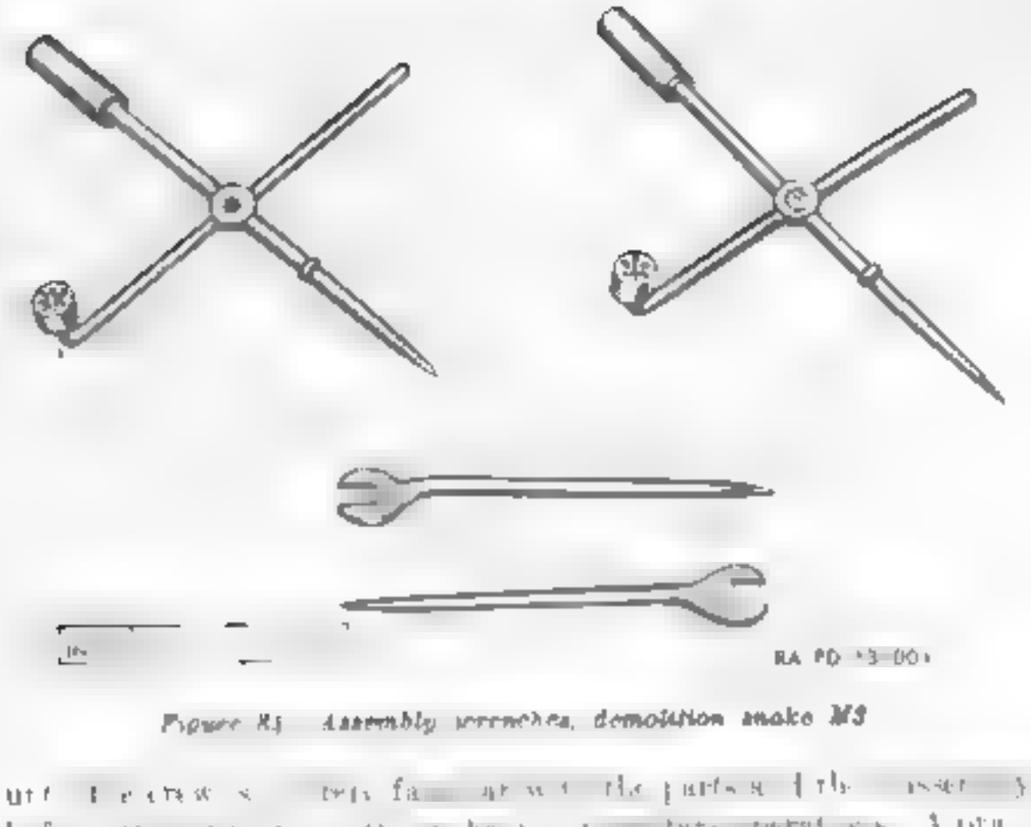


Figure 84. Assembly wrenches, demolition snake M3

[illegible] before attempting to assemble and detonate a snake. Practice detonation of a snake is desirable for the benefit of both assembly and operating personnel.

b. Assembly. [illegible] forward and [illegible] towing vehicle and backward [illegible] towing vehicle forward with [illegible] position for final detonation, preferably within 1 mile and in defilade from enemy fire and observation.

c. Procedure.

(*a*) Before starting assembly, clear an approximately level area 45 feet long from the center line of the prepared route. Four of these methods (*a* or *b* below) can be used.

a. Place expendable supports such as short logs or cast iron pipe 4 inches in diameter at 5-foot intervals along the line where the snake is to be assembled. Lay the end of the snake, with both ends of the explosive charges removed, from the bottom. Drive stakes at the ends of the logs, to keep them in position when towing the snake.

(*b*) Dig a trench 3 feet wide by 6 inches deep and 45 feet long, [illegible] of holes from the bottom. Place flat demolition snake [illegible] edges down across the trench at 5-foot intervals to support the snake during assembly. Five-foot lengths of 4-inch pipe or 4-inch logs may be used in

stead of the snake plates. Pile earth from the trench on the ends of the supporting plates, to prevent their displacement when towing the snake.

(2) The top of the demolition snake is divided into sections A, B, and C and the bottom into sections D, E, and F. Figure 85 lists the number of plates in each section and indicates the lapping of plates within sections. Assembly is facilitated if bottom plates are placed on one side of the assembly line and top plates on the other. Plates should be stacked in piles containing the proper number of plates for each section. Explosives are placed on the same side as the bottom plates. Since plates within each section have the same overlap, assembly crews can tell when a change in lapping is required by watching the stacks.

d. General Assembly Procedure. The general assembly procedure is as indicated in (1) and (2) below.

(1) Place bottom plates with center ridge up and aline bolt holes. Place cartridges and tamping bags in the corrugations. Place cover plates with center ridge down and aline bolt holes. Bolt top and bottom plates together. Tow completed portion to rear and retighten all bolts.

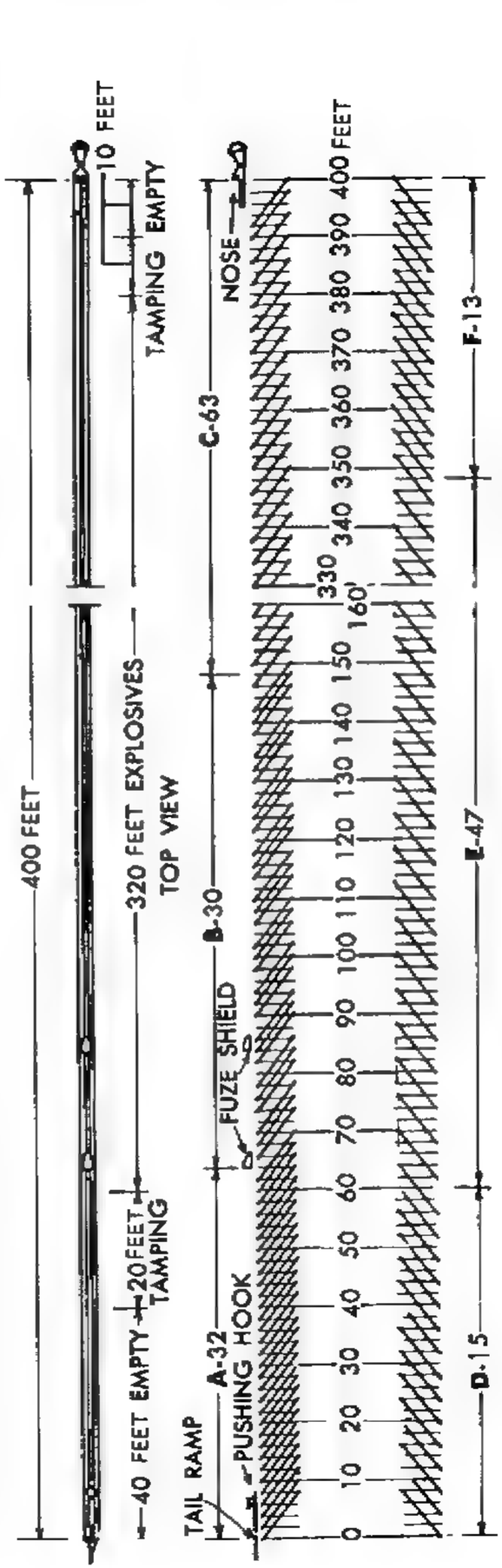
(2) To facilitate feathering of plates, assemble the demolition snake from rear to front. Build it in about 40-foot increments and tow it to the rear after each increment is added to minimize carrying of parts. Towing shakes the parts into better alinement, permitting bolts to be retightened, and increasing structural stability.

e. Detailed Assembly.

(1) *Rear 40 feet.*

(*a*) To assemble the rear 40 feet of demolition snake, underlap each successive under plate (sec. D, fig. 85), then overlap each successive cover plate (sec. A, fig. 85). The bottom-plate carrying detail carries plates from the proper stack and places them with the correct lapping. After lapping is checked by the noncommissioned officer in charge, aliners, working on the opposite side of the snake, aline the boltholes with driftpins or ends of assembly wrenches. Pins are left in place until they interfere with placing of top plates. This rearmost 40-foot section contains no explosives but, when time permits, is completely filled with tamping for additional stability.

(*b*) Aliners remove interfering driftpins from boltholes. Top plates are placed from the proper stack with the correct overlap and pins are reinserted for realinement. When the plates are placed and properly alined, the bolt carrier dis-



TOP SECTION	NO. OF PLATES
A	32
B	30
C	63
TOTAL	125

BOTTOM SECTION	NO. OF PLATES
D	15
E	47
F	13
TOTAL	75

Figure 85. Assembly diagram for demolition snake M3.

tributes one bolt two washers, and one nut to each bolthole along the demolition snake. Fasten tail ramp with rearmost bolt and hinge it forward to prevent its being damaged during assembly of the snake. Fasten pushing hook with four bolts immediately ahead of the rear bolt (fig. 86). The bolting detail removes the driftpins from each bolthole, thrusts the bolt, w washer through the hole from the bottom, places the top washer and hand tightens the nut. Wrench handlers then finish tightening the nuts with wrenches.

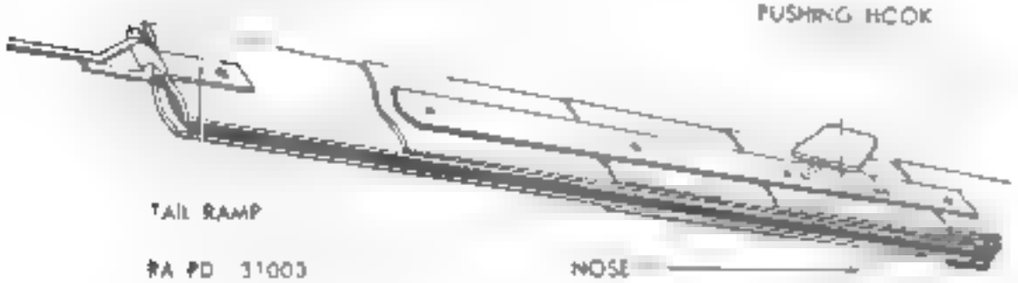


Figure 86. Assembled tail of demolition snake M3

(2) *Central portion of demolition snake*

(a) After the first 10 feet are towed to the rear, place the next 40 feet of bottom plates. The lapping of plates changes from three boltholes per plate at section D to two holes per plate at section E, 50 feet from the rear end of the demolition snake. Use all bottom plates from the first stack, then take plates from the next stack. At this stage, determine the locations of the fuze shields (fig. 87). The open end of the first fuze shield will be bolted to the snake at the thirty-first bolt from the rear end. The open end of the other shield will be located to the snake 1 bolt less 2 ft forward of the open end of the first shield. Place the first pair of cartridge-or-bangalore torpedoes with the forward ends 6 inches in front of the hole to which the open end of the shield will be fastened. This places the open end of the rear shield 64 feet from the tail of the snake and ensures that 4 inches of TNT booster area of the adjacent cartridges will be at the body of the fuze.

b Lightly pack earth-filled tamping bags (fig. 5) for 20 feet in back of rear-most explosive charges without disturbing the priming. Tie explosive-filled bags and additional charges forward of the two already placed. The charges of bangalore torpedoes must fit tightly end to end to prevent the crystalline TNT booster portion of the charge

from shifting from beneath the fuzes. This should be checked by the noncommissioned officer in charge.

c After the explosive charges are properly placed, assemble the cover plates, paying particular attention to the charge in lapping between sections A and B. During the bolting of this portion, mount the fuze shields on the cover plates at the predetermined locations. Do not place the fuzes in the shields until the assembly is complete and the snake is ready for use. Assemble successive portions of the snake similarly. Note the charge in lapping cover plates, 348 feet from the rear end.

(3) *Front portion of demolition snake*

(a) Assemble the front portion of the demolition snake in the same way. Lap one of the top plates in forward section C over four boltholes instead of three so the under and cover plates terminate at the same point. This four hole lap is made most easily with a cut plate.

b Place explosive charges on within 2 feet of the front end of the snake, then add 1 feet of tamping bags, to prevent them from moving.

Fasten the nose adapter between the under and cover plates at the forward end of the snake by the two front-most bolts. Slip the nose over the adapter and let it hang against the bumper ring. Pass one end of the nose retainer wire rope through the hole in the hook, through a plate, the nose, and past on this side the nose with the bar across the opening (see figs. 72 and 87).

c Position the remaining cover plates and bolt them in place. When assembly is completed, see that the safety forks and detonating-cord clips are not fastened, and detach the pushing hook and tail ramp.

d Arm the demolition snake by removing the safety forks and inserting the fuzes within the shields. The fuze must

Figure 87. Nose assembly, demolition snake M3

be seated well forward against the vertical steel plate inside the shield. Fasten the plate with the pin attached to the shield.

113 Assembly of Towing and Pushing Assemblies

a Towing Assembly. Bolt the towing rods and towing bail to the towing yoke. Pin the front ends of the rods to the rear towing lugs of the tank and shackle the towing spring to the towing bail as shown in figures 4 and 5.

b Pushing Assembly. Fasten the pushing beam to the front sockets of the tank as shown in figure 6.

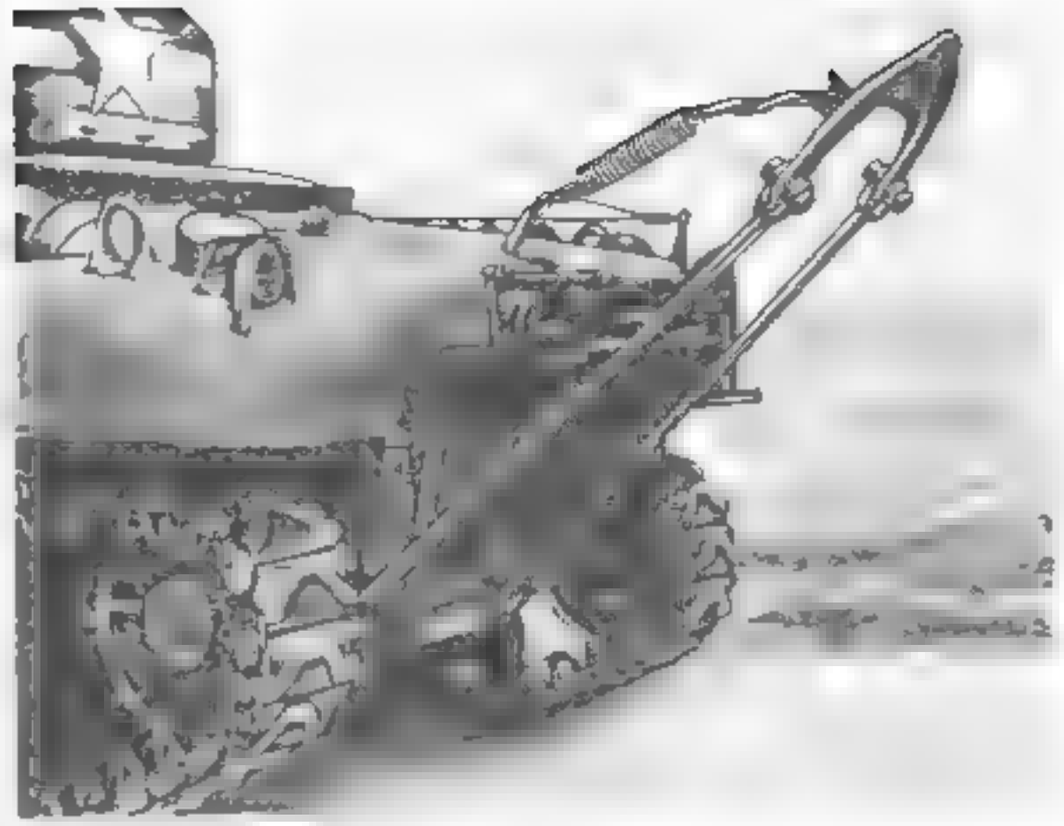
c Rigging Fixtures.

1) *Pulleys and mounting posts.* Five pulley support posts with pulleys, two rope guide rings with pulleys, and one rope guide ring are furnished with each demolition snake. They are used in raising the towing yoke and pushing beam and are welded on the tank hull. Location of the pulleys depends on the tank model. Figure 9 shows location of the fittings on several typical tanks. Posts and guide rings must be installed so that the rope leads to the winch when the turret is traversed and the gun is at its lowest elevation.

2) *Periscope fitting.* The periscope fitting is brought with the towing yoke and is used at the pushing beam rope enter the tank, fits in the periscope slot on most tanks. The bow gunner's hatch cover of most tanks of the M4 series has two periscopes, one in the hatch door and another in the hatch cover forward of the hatch door. The periscope fitting is inserted in the bow gunner's hatch cover periscope slot. On some early production models of tanks of the M4 series, the bow gunner has a periscope in the hatch cover and a direct vision port in the hatch door. When these tanks are used, the periscope fitting is inserted in the periscope slot in the bow gunner's hatch cover. In this case, the bow gunner's view is obstructed and he cannot use his machine gun and the coaxially mounted machine gun must be used to detonate the snake. As an alternate method, a cover plate for the radio antenna hole on the right front of the bow gunner may be removed and the direct vision port fitting mounted on the plate.

3) *Direct vision port fitting.* This fitting may be used in place of the periscope fitting. The cover plate over the bow gunner's direct vision port is removed and the fitting is inserted in the port and fastened in place.

4) *Rigging.* Tie the sash cord securely to the pushing beam. Thread it through the front pulley, and take it into the tank through the larger hole in the periscope or direct vision port.



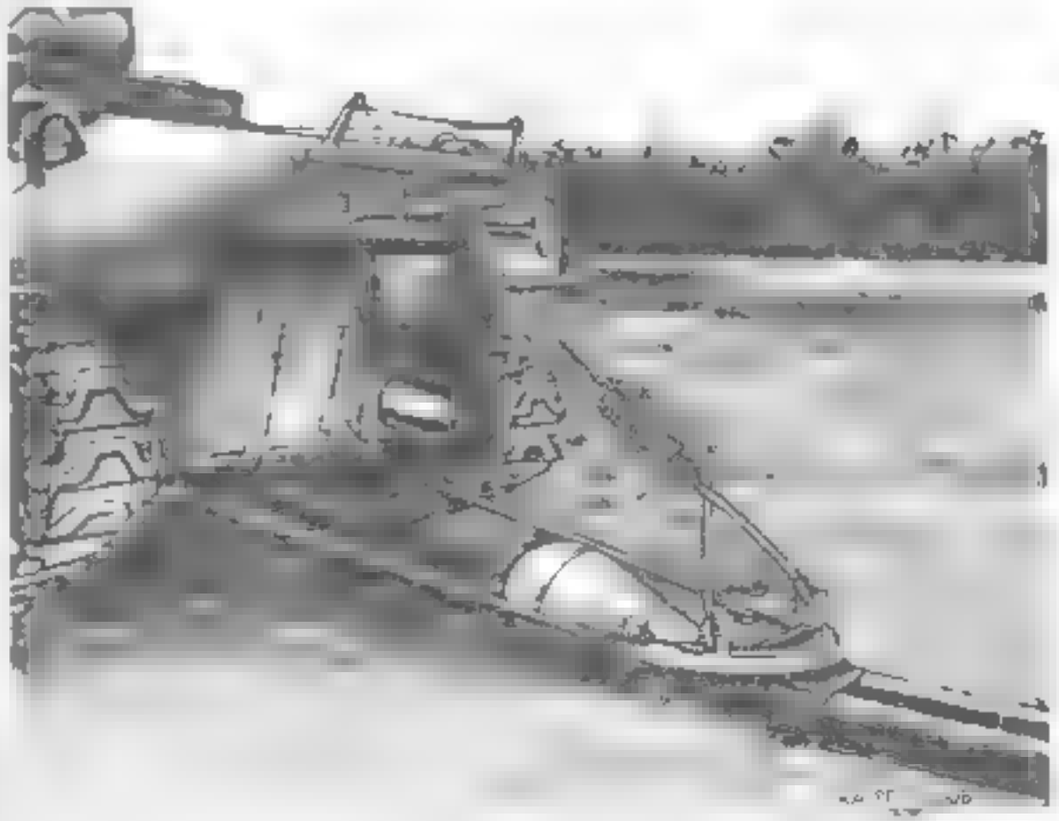
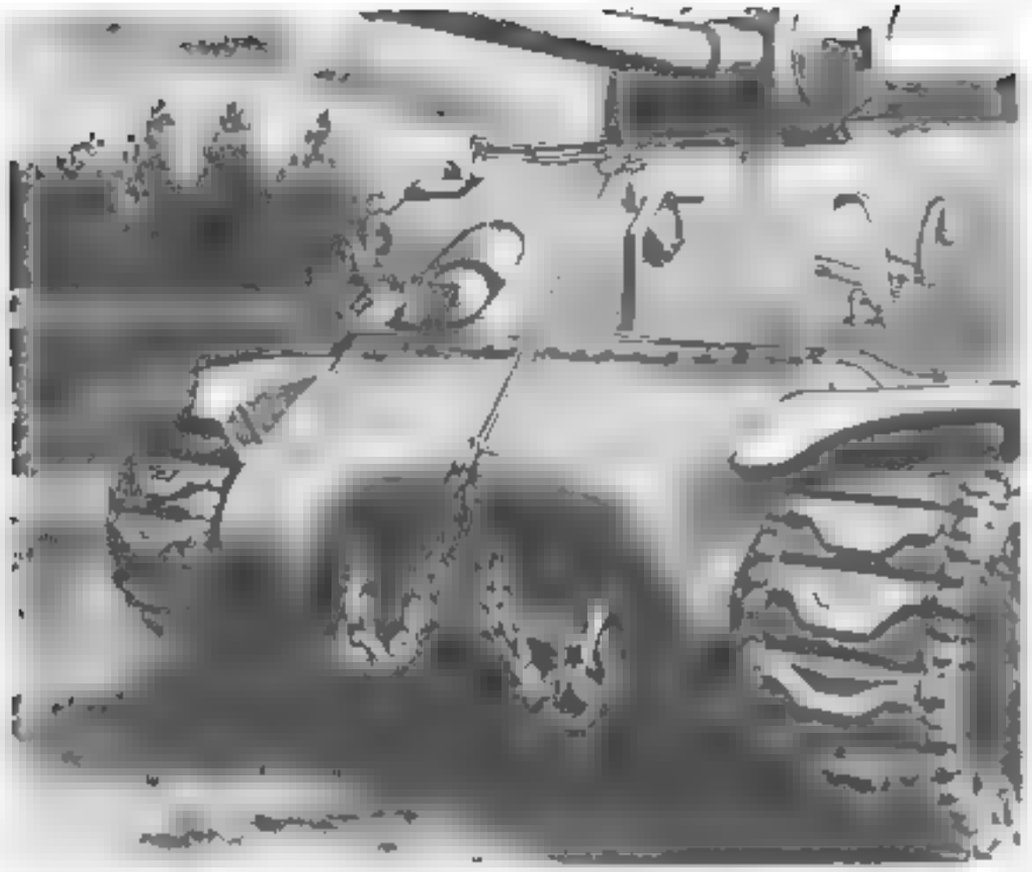


Figure 88 Towing assembly, demolition snake M3



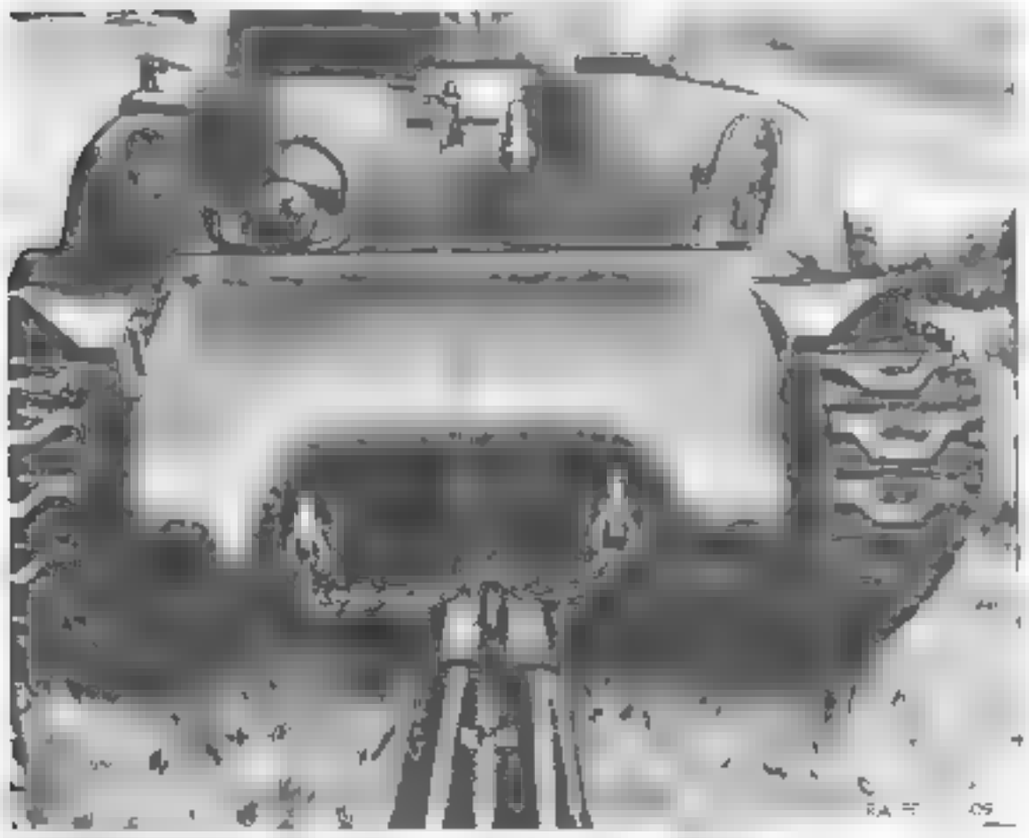
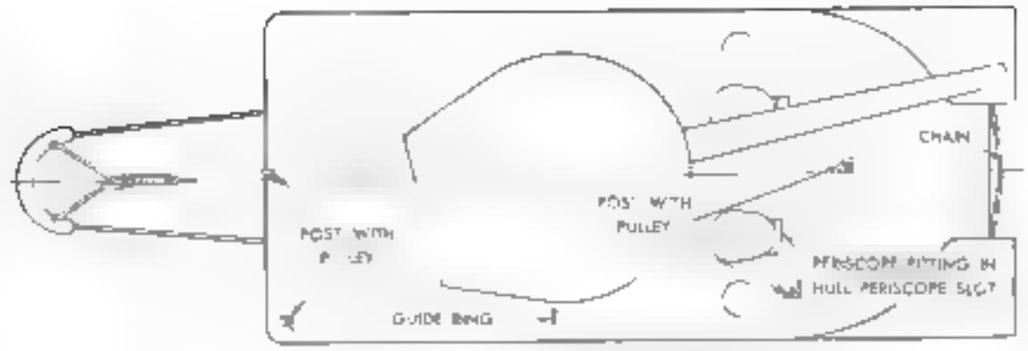
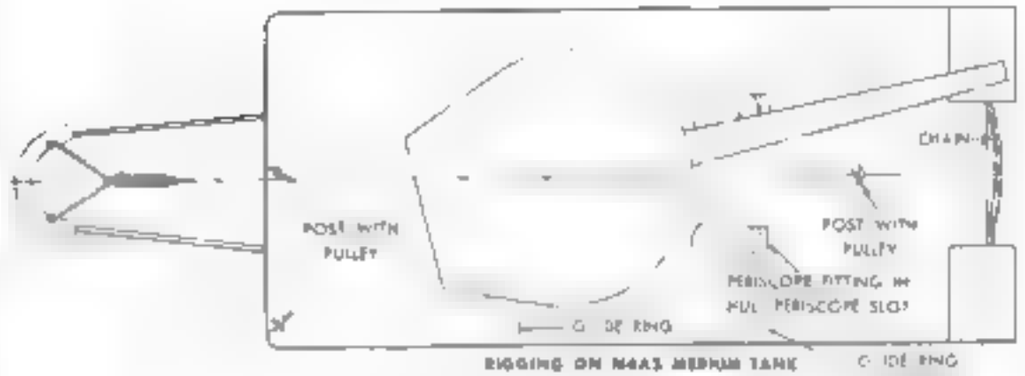


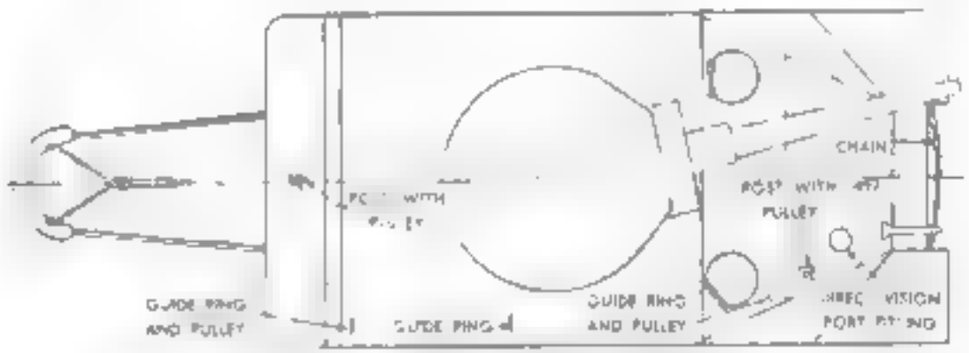
Figure 89 Pushing assembly demolition make M3



RIGGING ON M4A1 MEDIUM TANK



RIGGING ON M4A3 MEDIUM TANK



RIGGING ON M26 LIGHT TANK

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Figure 90 Location of rigging fixtures on tank hulls

fitting. Fasten one end of the winch cable to the coil spring on the lifting bar using the special cable clamp. Then, thread the cable through the pulleys and into the tank through the scalloped hole in the periscope or direct vision port fitting. Wind the end of the cable on the reel in the fitting. The pushing yoke is raised and lowered by hand with the sash cord. The towing yoke is raised by winding the reel in the periscope or direct vision port fitting. A wrench is provided for winding the reel fitting 91A; however, the yoke can be raised much faster using a ratchet wrench (fig. 91) and a 1/2" socket. To drop the yoke the ratchet bar on the reel is pushed to the right.

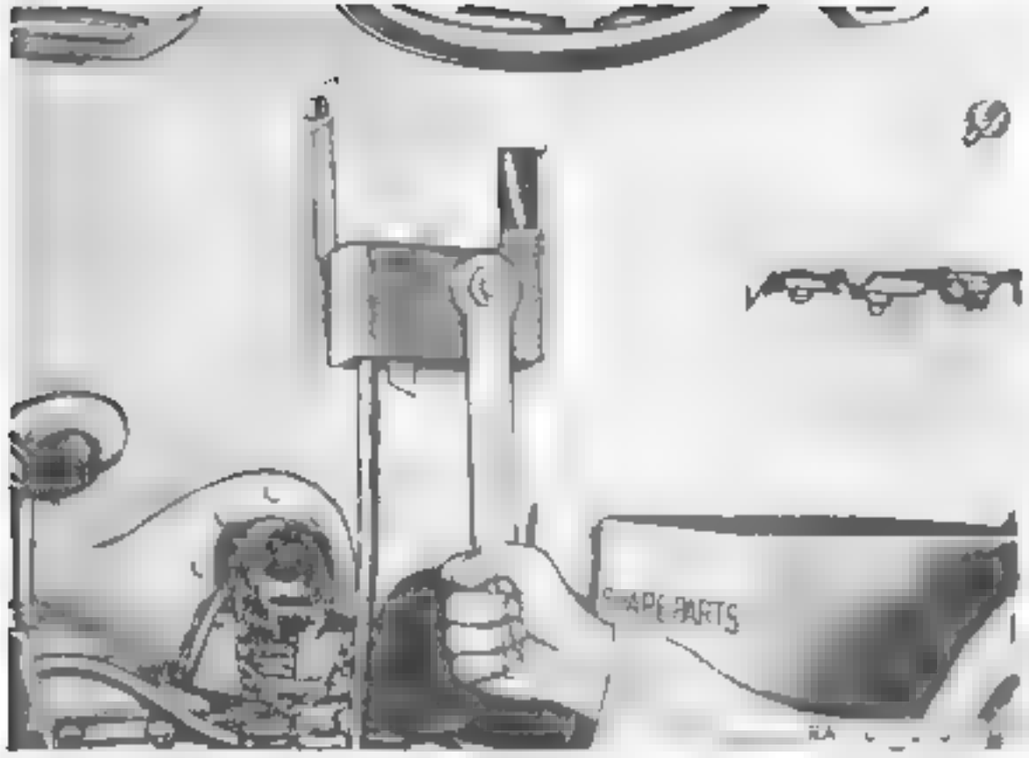

Figure 91 Medium tank bow gunner raising towing assembly with wrench issued with demolition snake M3

114 Night Assembly

a. Night assembly procedures are the same as during daylight, but extra precautions must be taken to avoid injuries to those times as long as the assembly. Personnel must be alert where tools are easily accessible and can be readily found. Close supervision is important to ensure proper assembly. Inspection must be made to ensure that all parts have been

b. Because of the blaze flares produced when the snake explodes, the operator often cannot be seen from a safe location during the night. Therefore when firing a demolition snake at night, a standard flashlight should be secured to the rear of the snake to fire, with the beam directed toward the firing device. An alternate method is to place a piece of white paper in front of the flashlight lens to diffuse the beam and point the flashlight toward the tank.

115. Safety Precautions

When a demolition snake is detonated the blast pressure is maximum toward the rear and is greatest on the flanks of the snake. Blast pressure from the detonation causes the tank to recoil forward. If the snake is fired immediately after it is released by the tank, danger from the explosion may exist in the tank if any ports are open. However, there will be no danger to the tank or crew members if the safety precautions listed in a through e below are observed. Detona-

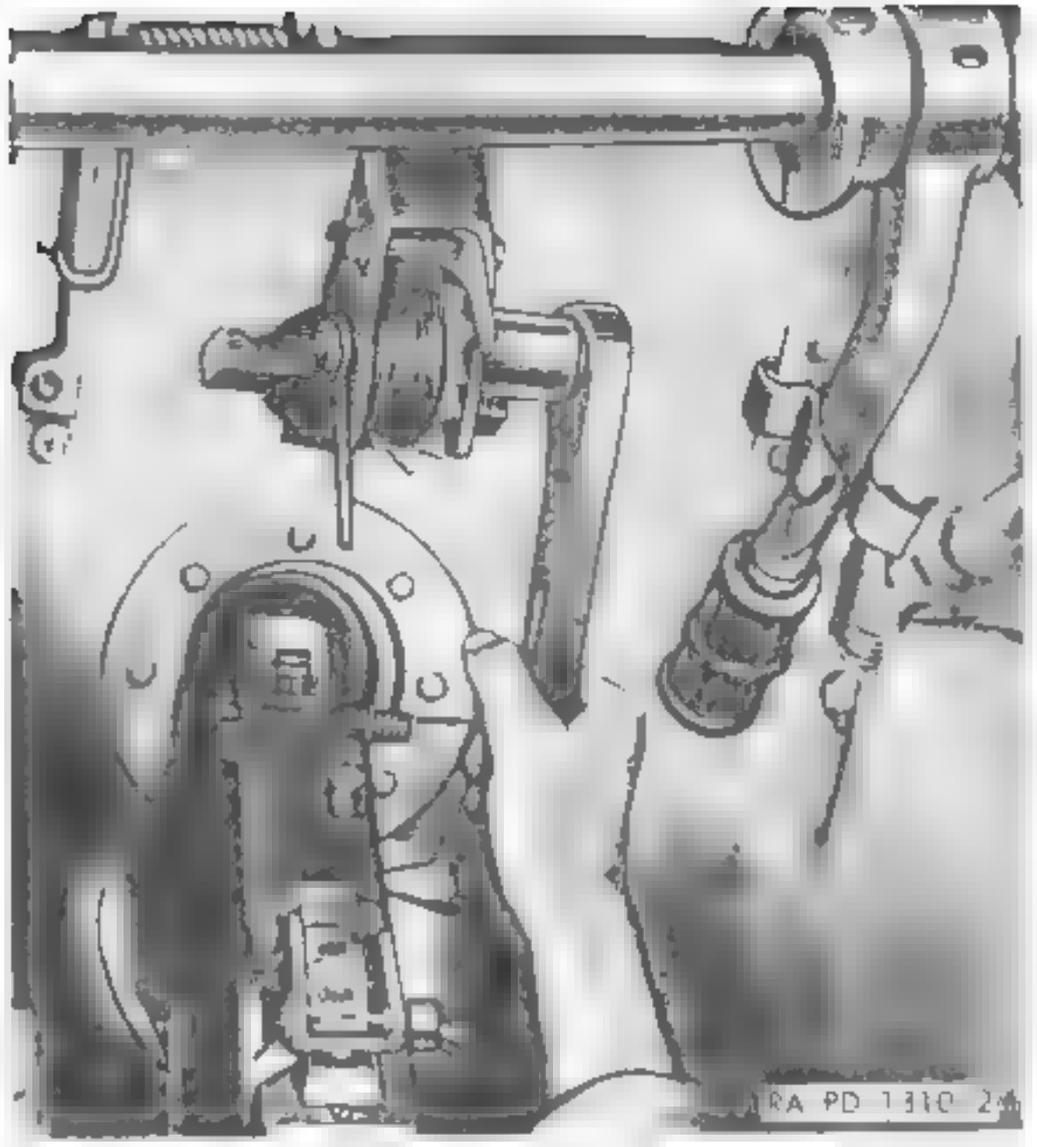

Figure 92 Light tank bow gunner raising towing assembly using ratchet wrench

tion causes throw fragments as far as 200 yards to the rear of the tank, but most of the fragments are thrown at angles of the flare axis. Unexploded snakes must be taken with the

a. *Fuel and Lubricating Oil.*

(1) All loose oil and fuel drippings must be removed from inside the tank.

(2) Fire extinguishers must be in good working condition and ready for use.

(3) Power plant must be locked securely.

(4) Windshield wipers must be removed.

(5) Hatch covers must be properly fastened.

(6) Gaskets and latches on hatch covers must be in good condition.

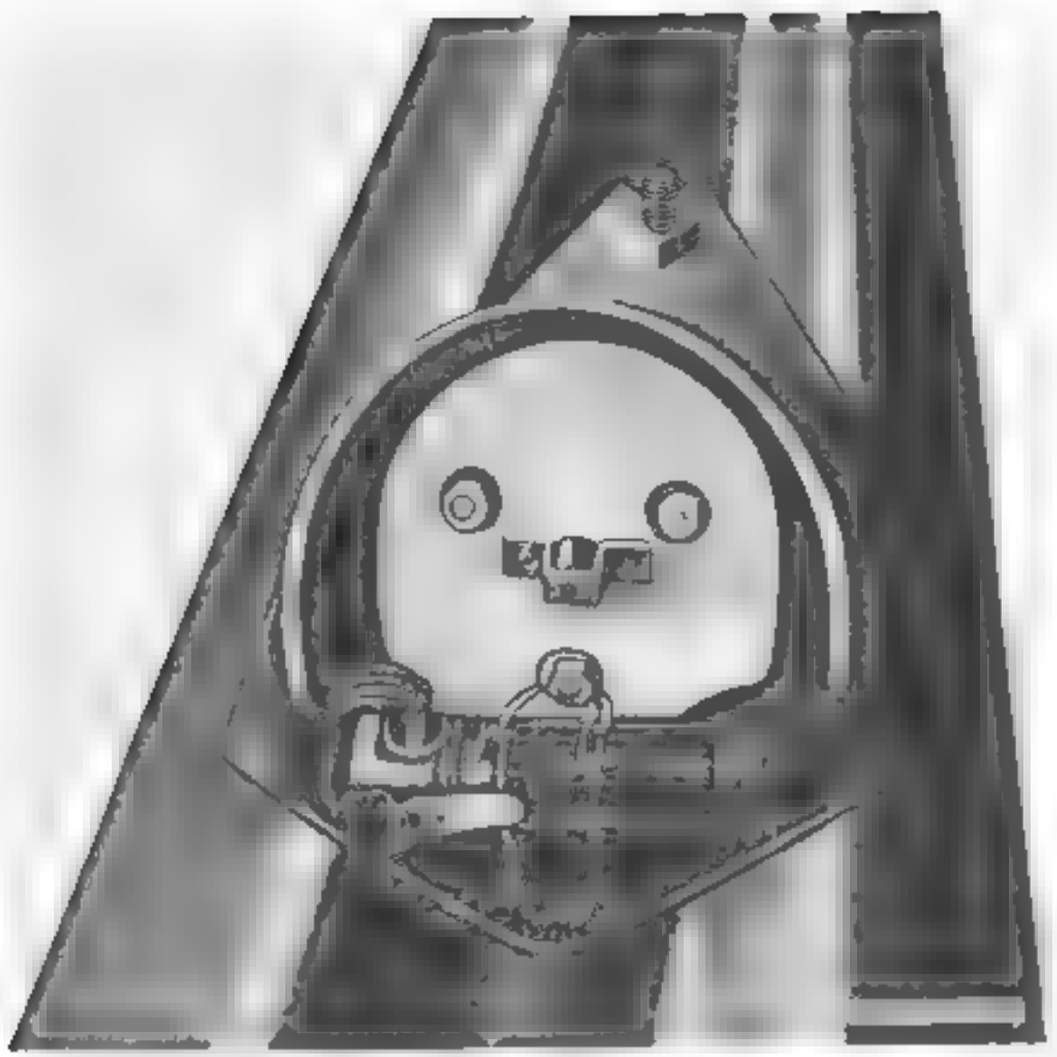

Figure 83. Faze, bullet impact M1 illuminated by flashlight.

7) Hatch doors must be securely latched. Detonation of a snake will blow open improperly latched hatch covers.

8) Periscopes must be removed in periscope hoods.

9) Snake mortar, turret race gears, and bow machine gears must be in place or wooden plugs wedged in openings.

10) Canvas or asbestos should be stuffed around fan and turret vent motors to minimize dirt blowing into tank.

(11) Canvas or asbestos should be stuffed in gun shield opening behind gun motor sleeve, to prevent flame from explosion from entering tank.

b. Tanks Close to the Task Position or Pushing the Demolition Snake.

(1) **The minimum safe lateral distance for tanks is 100 yards.**

2. Tanks within 500 yards should have all ports and slits closed and all hatch doors securely latched.

c. Personnel Outside of Tanks.

1) No personnel must be within 250 yards of snakes in firing position or armed snakes being towed or pushed.

2. Personnel must take cover when 250 to 300 yards away laterally or 250 to 300 yards to the rear of an armed snake.

116. Towing and Pushing

The average tank driver requires 1 week of daily practice in pushing and towing short demolition snakes loaded with tamping material to become proficient. Before a live snake is towed or pushed precautions listed in paragraph 115 must be taken.

a. Towing.

1) Align the tank with the demolition snake in front of the nose, then back the tank until the towing yoke is behind and above the towing hook. Take care not to back over the nose and crush it. The bow gunner releases the nose locking the towing yoke and the yoke falls into the snake behind the towing hook. The tank then moves forward slowly until the yoke engages the hook. Towing assembly is shown in figure 88.

(2) **When towing a demolition snake, it is important that changes** in direction and speed be made gradually and without jerking.

3) Tow the demolition snake as close as possible to the obstacle. The last 400 feet of the tow must be as straight as possible, **so the snake will take a straight course when pushed into** the obstacle. When the snake is to be propelled stop the towing tank and back it about 2 feet to disengage the yoke from the towing hook. Raise the yoke by cranking up the cable on the periscope fitting. The yoke is raised much **faster using a ratchet wrench and a 1-inch socket rather than** the wrench furnished with the snake. Then move the tank forward far enough to clear the rest of the snake before turning.

b. Pushing.

1) *Alinement.* To push a demolition snake, approach the tail of the snake and align the tank with the snake. Practice is required to align the center of the tank with the snake, because the driver is seated off center and his view is restricted. **Pronounced misalinement may cause the snake to buckle during pushing.**

(2) *Engaging pushing hook.* Before reaching the tail ramp, the bow gunner releases the pushing chain (fig. 89). The tank then advances slowly until the chain engages the pushing hook and the hook is pulled up and held against the belly of the tank.

(3) *Starting push.* After picking up the hook, the tank starts forward in lowest gear and slowly accelerates until it is running in second or third gear. Alinement of the center of the tank over the center of the snake must be preserved and the driver must follow the snake carefully, *making no attempt to guide it.* Attempts at guiding usually cause structural failure of the plates immediately in front of the tank.

(4) *Observation by tank driver.* The driver must frequently manipulate the periscope to observe the terrain ahead, the behavior of the nose, the relative alinement of the tank with the snake, and the condition of the snake near the tank. The entire length of a 400-foot snake is seldom completely within the limited field of vision of the periscope.

(5) *Releasing the snake.* To release the snake, back the tank up far enough to clear the chain from the hook. The chain is pulled up by hauling in on the control rope.

117. Detonation

The flash of flame produced by detonation of the demolition snake M3 (aluminum plates) is greater than that produced by detonation of the M2 and M2A1 models (steel plates). It may extend back to the tail of the snake, and, if the snake is detonated immediately after the tank disengages from the pushing hook, the tank may be partially enveloped in flame for an instant. A number of snakes have been fired with the tank in this position without injuries or damage. All precautions listed in paragraph 115 were taken. It is preferable, after dropping the snake, to back the tank up about 40 feet before detonation. However, the snake can be fired while pushing, without stopping to unhook or back up, and the tank can immediately advance through the cloud of smoke and dust raised by the explosion, the driver feeling his way through the crater.

a. Bullet Impact Fuze. The demolition snake is normally detonated by firing at one of the fuzes mounted on the snake with either machine gun mounted on the tank. Two fuzes are provided, because the position of the snake may place one of the fuzes where it is difficult to see or hit. The coaxially mounted machine gun is generally the better gun to use, because it is mounted higher in the tank. In medium tanks where the periscope fitting is inserted in the hatch cover, the bow gunner's view is obstructed hence the coaxial gun must be used. Tracer ammunition must be used when firing at night with the fuzes illuminated (see fig. 93).

b. Detonating Snake with Tank Gun. If neither fuze can be hit by machine-gun fire, the demolition snake is detonated by a direct hit from the tank gun (37-mm and over), using a high-explosive shell with superquick fuze. The snake will explode when any loaded section is hit. Fire should not be directed at the snake's rear 60 feet, which contains no explosive.

118. Effectiveness of Demolition Snake M3

a. Most Suitable Terrain. Demolition snakes are most effective in flat or moderately rolling, open, or lightly wooded terrain. Such terrain, moreover, is suitable for maneuvering tanks.

b. Crater. The size of the crater blasted by a demolition snake depends on the type of soil and its moisture content. In most soils, the crater will be 320 feet long, 12 to 16 feet wide, with maximum depth of 3 to 5 feet. The crater provides a well-marked route for tanks.

c. Breaching Obstacles.

(1) The principal use of demolition snakes is breaching mine fields; however, they may also be used to breach bands of log posts, steel rails, antitank ditches, and some small concrete obstacles. Effectiveness of the snake depends on type, shape, height, weight, spacing and emplacement depth of the individual obstacles, and ground characteristics. The snake is either pushed through or over the obstacles. Length of snake used depends on the depth of the obstacle. When fired, the section of snake loaded with explosives must be over or adjacent to the obstacle. When the snake is detonated, a crater is blasted and the obstacles in the crater are generally shattered or blown out of the crater, depending on the characteristics of the obstacles.

(2) Against reinforced-concrete obstacles interconnected by ground sills and against large reinforced-concrete blocks, detonation of a single demolition snake may not produce an adequate breach, because of the weight and strength of the blocks and because good contact of explosives with surface of concrete is not obtained.

(3) Success in breaching antitank ditches depends on the depth, width, and revetting of the ditch and whether the nose of the demolition snake clears the far side of the ditch. Detonation of a demolition snake breaks down the sides of the ditch. In average unrevetted ditches 5 feet deep, a single snake will blast a gap passable by tanks. Deeper ditches may require the detonation of a second snake in the crater of the first. It is generally not practicable to breach ditches deeper than 8 feet.

119. Comparison of Demolition Snake Models

a. Principal differences between demolition snake M2, M2A1, and M3 are tabulated below:

	M2	*M2A1*	*M3*
Total net weight.	12,500 lb	15,000 lb	9,000 lb
Corrugated plates.	Steel	Steel	Aluminum
	53 lb	53 lb	16 lb
	164	172	200
Washers	1 per bolt	1 per bolt	2 per bolt
	2 in. long	2 in. long	4 in. long
Nose	Steel	Steel	Aluminum
	Two-piece, bolted.	Two-piece, bolted	One-piece, welded
	Held to adapter by bolt	Held to adapter by special retainer.	Held to adapter by special retainer.
Tamping bags	Paper	Paper	Cloth or paper
Pushing attachment.	Wire rope	Steel chain	Steel chain
Total explosive load.	3,200 lb	4,500 lb	4,500 lb
Explosive cartridges.	4 feet long	5 ft long	5 ft long
	20-lb explosives	35-lb explosives	35-lb explosives
	Steel casing	Aluminum casing.	Aluminum casing
	Circular in cross section.	Elliptical in cross section.	Elliptical in cross section.
Fuze and shield	1	2	2
Towing assembly and rigging.		M2 fittings and rigging improved and strengthened.	M2 fitting and rigging improved and strengthened.
	Rope on towing yoke raised by hand.	Cable on towing yoke raised by winch on periscope fitting.	Cable on towing yoke raised by winch on periscope fitting.

b. Assembly procedure for demolition snake M2 and M2A1 is similar to that of the snake M3, except that lapping of the steel plates differs from that prescribed for aluminum plates.

c. With demolition snake M2 and M2A1, an expedient nose can be used in place of the standard pear-shaped nose and adapter. It is built from steel body plates and is fastened to the two foremost bolt holes of the assembled snake. This nose is better adapted for pushing snakes over obstacles presenting a vertical face of limited height.

CHAPTER 6

DESTRUCTION OF AMMUNITION TO PREVENT ENEMY USE

120. General

a. Destruction of demolition materials, when subject to capture or abandonment, will be undertaken by the using arm only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of or policy established by the Army commander.

b. This information is for guidance only. The conditions under which destruction will be effected are command decisions and may vary in each case, dependent upon a number of factors such as the tactical situation, security classification of the demolition materials, their quantity and location, facilities for accomplishing destruction, and time. In general, destruction of demolition materials can be accomplished most effectively by burning or detonation or a combination of these. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, demolition materials and their components must be so badly damaged that they cannot be restored to a usable condition in the combat zone. Equally important, the same essential components of all demolition materials must be destroyed, so that the enemy cannot assemble complete rounds from undamaged components of several damaged complete rounds.

d. If destruction of demolition materials is directed, due consideration should be given to (1) and (2) below.

(1) Selection of a site (place for the destruction operation) that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments, which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

121. Methods

Demolition material can be most quickly destroyed by burning or detonation. The methods in *a* and *b* below, in order of preference, are considered the most satisfactory for destruction of demolition materials to prevent enemy use.

a. Method No. 1—By Burning.

(1) *General.* Packed and unpacked high-explosive items such as, cratering charges, shaped charges, demolition blocks, dynamite cartridges (sticks), detonating cord, firing devices, time blasting fuse (safety fuse), and similar items may be destroyed quickly and effectively by burning. Blasting caps set aside for destruction by burning must be stacked in separate piles and not with other explosives.

(2) *Method of destruction.*

(*a*) The explosives should be stacked in a pile if possible (not over 2,000 lb to a pile).

(*b*) Pour fuel oil over the entire pile.

(*c*) Ignite the pile by means of a combustible train (excelsior or slow burning propellant) of suitable length and take cover immediately. The danger area for piles being burned in the open is 400 yards.

Caution: Cover must be taken without delay, since an early explosion of the explosive materials may be caused by the fire.

b. Method No. 2—By Detonation.

(1) *General.* Packed and unpacked high-explosive items such as cratering charges, shaped charges, demolition blocks, dynamite cartridges (sticks), detonating cord, blasting caps, firing devices, time blasting fuse (safety fuse), and similar items may be destroyed by placing them in piles and detonating them with TNT, COMP C, or other explosives of equivalent potential.

(2) *Method of destruction.*

(*a*) The explosives should be stacked in piles if possible (not over 2,000 lb to a pile).

(*b*) Each 100 pounds of packed explosives (mines, blocks, etc.), require a 2-pound (min) explosive charge, to insure complete detonation of the pile. For unpacked explosives, a 1-pound (min) explosive charge for each 100 pounds is sufficient.

(*c*) Prepare the explosive charge, using EXPLOSIVE, TNT or equivalent together with the necessary detonating cord per charge, and place the charge on top of the pile to be detonated and then cover with earth or other inert material.

(*d*) Provide for dual priming as explained in FM 5–25, to minimize the possibility of a misfire. For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse, or time blasting fuse (safety fuse burns at the rate of 30 to 45 seconds per foot—test whichever is to be used before using), or an electric blasting cap and firing wire may be used. Safety fuse or time blasting fuse, both of which contain black powder, and blasting caps must be protected from moisture at all times. Safety fuse or time blasting fuse may be ignited by a fuse lighter or an ordinary match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Blasting caps, detonating cord, and safety fuse and time blasting fuses must be kept separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the provision of FM 5–25. Training and careful planning are essential.

(*e*) Detonate the charges. If primed with nonelectric blasting cap and safety fuse or time blasting fuse, ignite and take cover; if primed with electric blasting cap, take cover before firing the charges. The danger area for piles detonated in the open is a circular area of a radius, which varies according to the quantity of explosive items to be destroyed. Quantity-distance data for inhabited buildings as given in TM 9–1900 may be used as an approximate guide for such operations as are contemplated in this chapter.

APPENDIX I

COMPLETE ROUND TABLE

Demolition explosive	Priming means [1]	Initiating means	
CORD, detonating (PETN) (FUZE, primacord). [2] DYNAMITE, ammonia, 40%. DYNAMITE, ammonia, 60%. DYNAMITE, ammonia, gelatin, 40%. DYNAMITE, gelatin, 40%. DYNAMITE, gelatin, 60%. DYNAMITE, gelatin, 75%.	CAP, blasting, electric, No. 6 or No. 8.	Electric current.	
	CAP, blasting, nonelectric, No. 6 or No. 8.	FUSE, safety, M700 or FUSE, blasting, time.	Match
			LIGHTER, fuse, weatherproof, M2.
		FIRING DEVICE, any.	
BLOCK, demolition, chain, M1. BLOCK, demolition, M2. [1] BLOCK, demolition, M3, COMP C2. BLOCK, demolition, M3, COMP C3. BLOCK, demolition, M5A1. CHARGE, explosive, cratering, ammonium nitrate, in 40-lb waterproof metal container.	Any cap, cord, or detonator listed below in this column and corresponding initiator.		
	CAP, blasting, special electric.	Electric current.	
	CAP, blasting, tetryl, electric.		
	CAP, blasting, special, nonelectric.	FUSE, safety, M700 or FUSE, blasting, time.	Match
			LIGHTER, fuse, weatherproof, M2.
CHARGE, shaped, 15-lb, M2A3. [1] CHARGE, shaped, 40-lb, M3(3). [1] DYNAMITE, military, M1. DYNAMITE, military, M2. DYNAMITE, military, M3. EXPLOSIVE, nitrostarch (various size blocks). EXPLOSIVE, TNT [1] (various size blocks). TORPEDO, bangalore, M1A1. [1] [3]	CAP, blasting, tetryl, nonelectric.	FIRING DEVICE, any.	
	CORD, detonating (PETN) (FUZE, primacord). [2]	CAP, blasting, any.	FUSE, safety M700, or FUSE, blasting, time.
			Match
			LIGHTER, fuse, weatherproof, M2.
			FIRING DEVICE, any.
	DETONATOR, concussion type, M1. DETONATOR, 8-sec delay, M2. DETONATOR, 15-sec delay, M1.	None.	
CABLE, detonating, mine clearing, antipersonnel, M1.	CAP, blasting, special, nonelectric.	FUSE, safety, M700 or FUSE, blasting, time.	LIGHTER, fuse, weatherproof, M2.
CHARGE, for demolition snake M2. CHARGE, for demolition snake M2A1 and M3.	FUZE, bullet impact, M1A1.	Bullet impact.	
CHARGE, propelling, M12, w/primer, M44, for ROD, earth, blast-driven.		Match or LIGHTER, fuse, weatherproof.	

[1] ADAPTER, priming, M1A4 or ADAPTER, priming, M1A2 or M1A3, may be used with electric and nonelectric blasting caps and with detonating cord and is intended for use with demolition items having firing device wells with standard threads.

[2] CORD, detonating may be placed in priming adapter or may be wrapped around the demolition explosive, except in the case of shaped charges.

[3] Connecting sleeve and/or nose sleeve may also be used.

APPENDIX II

REFERENCES

1. Publication Indexes

DA pamphlet 310-series, DA Pam 108–1, FM 21–8, AFR 5–3, AF Film Catalog, and TO 00–1–11 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

The following supply manuals of the Department of the Army Supply Manual pertain to this ammunition:

a. Explosive Materials Required for Destruction.

Land Mines and Components; Demolition Explosives and Related Items; and Ammunition for Simulated Artillery, Booby Trap, Hand Grenade, and Land Mine Fire.	ORD 3 SNL R–7

b. Maintenance and Repair.

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNL K–1
General Tools and Supplies for Ordnance Ammunition Company.	ORD 10 SNL N–17
Special Tools for Ordnance Explosive Disposal Munitions, Ammunition Renovating Tools, and Bomb Handling Tools.	ORD 3 SNL J–11, section 2
Tool Set, Maintenance (Field), Explosive Ordnance Disposal Squad.	ORD 6 SNL J–8, section 1
Tool Set, Maintenance (Field), Ammunition Renovation Platoon.	ORD 6 SNL J–8, section 4

c. Training Aid.

Training Aid Catalog	TO 28–1–3 (USAF)

d. USAF Supply Catalog.

USAF Supply Catalog	Class 28E (USAF)

3. Forms

The following forms pertain to the ammunition covered in this manual:

OO Form No. 517, Ammunition Condition Report
OO Form No. 5981, Complete Round Charts
OO Form No. 7235, Ammunition Condition Report
AF Form No. 191, Ammunition Disposition Report
AFR 65–19, Ammunition Disposition Report

4. Other Publications

The following explanatory publications contain information pertinent to this ammunititon and associated equipment.

a. Ammunition, All Types.

Distribution of Ammunition and Explosives for Training Purposes.	SR 710–60–50
Ammunition and Explosives Materiel—Surveillance and Safety.	AFR 136–6
Ammunition, General	TM 9–1900
Ammunition Identification Code (AIC)	TB 9–AMM 5
Ammunition Inspection Guide	TM 9–1904
Ammunition Renovation	TM 9–1905
Transportation by Water of Explosives and Hazardous Cargo	AR 55–228

b. Camouflage.

Camouflage, Basic Principles	FM 5–20

c. Decontamination.

Decontamination	TM 3–220
Defense Against Chemical Attack	FM 21–40

d. Destruction to Prevent Enemy Use.

Explosives and Demolitions	FM 5–25

e. General.

Dictionary of United States Army Terms	SR 320–5–1
Engineer Field Data	FM 5–34
Engineers' Reference and Logistical Data	FM 5–35
Engineer Soldier's Handbook	FM 21–105
Inspection of Ordnance Materiel in the Hands of Troops	TM 9–1100
Military Chemistry and Chemical Agents	TM 3–215
Ordnance Service in the Field	FM 9–5
Report of Loss, Theft, and Recovery of Government Property	SR 210–10–10

f. Maintenance and Repair.

Abrasive, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Materiel.	TM 9–850

g. Shipment and Limited Storage.

Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage and Shipping.	TM 9–1005
Marking and Packing of Supplies and Equipment: Marking of Oversea Supply.	SR 746–30–5
Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment.	SR 745–45–5
Ammunition: Restricted or Suspended	TB 9–AMM 2
Ammunition Supply	AFR 67–28
Ammunition Surveillance Manual	OFSB 3–20
Carrying Live Bombs and other Ammunition on Tactical Aircraft.	AFR 55–25
Characteristics and Employment of Ground Chemical Munitions.	FM 3–5

Coordination with Armed Services Explosives Safety Board Report of Hazardous Conditions Involving Military Explosives or Ammunition.	SR 385–15–1
Disposal by Dumping at Sea	SR 75–70–10
Ammunition	SR 755–140–1
Employment of Land Mines	FM 20–32
Explosive Ordnance Disposal Policies and Responsibilities	AR 75–15
Identification of Inert Ammunition and Ammunition Components.	SR 385–410–1
Issue of Supplies and Equipment: Processing Requisitions	SR 725–10–2
Land Mines	TM 9–1940
Land Mine Warfare	TC 34
Military Explosives	TM 9–1910
Military Pyrotechnics	TM 9–1981
Ordnance Ammunition Service in the Field	FM 9–6
Passage of Obstacles other than Mine Fields	TM 5–220
Pricing Guide—Ammunition	ORD 5–3–6
Qualifications and Familiarization	AR 370–5
Regulations for Firing Ammunition for Training, Target Practice, and Combat.	SR 385–310–1
Reports	SB 9–AMM 8
Reports of Malfunctions and Accidents Involving Ammunition and Explosives (during Training or Combat).	SR 700–45–6
Accident Reporting	SR 385–10–40
Small-Arms Ammunition	TM 9–1990
Transportation of Explosives and other Dangerous Articles	AR 55–225

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